

Innovative and competitive
new joining technology for steel pipes using adhesive bonding



Project Proposal connects
8 Partners
5 European Countries





Proposal overview submission form
for
Research, Pilot and Demonstration projects and
accompanying measures for the promotion of knowledge gained (Type 2)

A0. INFORMATION ON THE PROPOSAL ¹						
Proposal Full Name	Innovative and competitive new joining technology for steel pipes using adhesive bonding					
Proposal Acronym²	JoinTec					
Research area³	Coal	<input type="checkbox"/>			Steel	<input checked="" type="checkbox"/>
Type of Proposal⁴	Research	<input checked="" type="checkbox"/>	Pilot /Demonstration	<input type="checkbox"/>	Type 2	<input type="checkbox"/>
Starting Date (DD/MM/YYYY)	01/07/2007		Project duration (in months)⁵		36	
Research priority⁶	Steel 2		Technical Group⁷	TSG 8		

N ^{o8}	Contractor's Role ⁹	Full official denomination ¹¹	Country name	Total costs (Euro)	Contribution requested ¹² (Euro)
1	CO.	University of Paderborn	Germany	522.265	313.359
2	CR.	Salzgitter Mannesmann Forschung GmbH	Germany	422.167	253.300
3	CR.	Gaz de France	France	15.212	9.127
4	CR.	Sika Danmark A/S	Denmark	184.750	110.850
5	CR.	Bohlen & Doyen Polska Sp. Z o.o.	Poland	202.260	121.356
6	CR.	Centro Sviluppo Materiali S.p.A.	Italy	280.000	168.000
7	CR.	Mannesmann Fuchs Rohr GmbH	Germany	92.650	55.590
8	CR.	Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft – e.V.	Germany	9.720	5.832
Grand Total				1.729.024	1.037.414

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Proposal No	
Post stamp	Reception date



A1. PROPOSAL ADMINISTRATIVE OVERVIEW

Proposal summary

This research work will introduce the pace developments in adhesive bonding technology of recent years into the steel pipe industry. The aim of this project is to increase the competitiveness of European steel pipe industry by developing an innovative and competitive bonding technology for steel pipes distributing gas, water and heat.

Objectives:

- Development of an efficient, integrated and easy-to-use technique for adhesive bonding of steel pipes based on an interdisciplinary collaboration between leading research institutes, adhesive industry and pipe industry including end users, and
- Development of guidelines, design calculation methods and non-destructive testing methods including a repair concept for adhesively bonded steel pipes.

Proposal resubmission: Yes (see also A3)

Reference, title, date of actual or expected completion of all previous EC or ECSC projects related, even partly, with the objectives of the proposal: (use an annex if necessary):

Contract No.	Project name	Start	End
7210-KC-806	Weight reduction of vehicle sub-assemblies using thin walled adhesively bonded steel composite structures	01.07.1985	30.06.1988
7210-SA-817	The use of adhesive bonding in steel framed buildings and structures	01.07.1987	30.06.1990
7210-MB-808	Effect of environment and temperature on long-term durability of adhesive bonded joints in zinc and organic coated steels	01.07.1991	30.06.1994
7210-MA-438	In-service qualification of adhesively bonded stainless steel components	01.07.1996	30.06.1999
7210-PR-258	Long term durability of adhesively bonded sandwich panels	01.07.2000	30.06.2003

Explain in a concise manner to what extent your proposal brings added value to what has already been achieved through these projects

Due to the pace developments in adhesive bonding this bonding technology is becoming more and more important. The previously funded projects underline the interest and research need in terms of adhesive bonding in order to use its high capacity and multifunctional potential.

Different from earlier research projects this project will comprise research about adhesively bonded pipe joints in order to develop both an innovative and competitive joining concept for steel pipes in the water, gas and heat distribution net where the requirements (e.g. influence of medium, internal pressure) are different from the applications covered by previous projects. This innovative joining concept will be based on the latest achievements in adhesive technology and pipe laying industry. This research proposal is an interdisciplinary approach between leading European research institutions in the steel area, research departments specialised in adhesive bonding, adhesive industry, steel pipe suppliers, pipe laying industry and end users of pipeline networks.



A2. PROPOSAL SHORT DESCRIPTION

TITLE:

Innovative and competitive new joining technology for steel pipes using adhesive bonding

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1. INTRODUCTION

The general aim of the Research Fund for Coal and Steel (RFCS) is to increase competitiveness of the European steel industry. As pointed out in the “European Steel Technology Platform – Vision 2030” (March 2004) an increase in steel market share can be achieved by the use of new bonding technologies.

Joining technology is playing an increasingly important role in all phases of a product life which includes the design, development, fabrication, utilisation, maintenance and repair of a product as well as its recycling and disposal. Joining technology will continue to account for a large proportion on the value added in the producing sector with prospects of further growth [20]. Consistently interdisciplinary approaches in research, development, fabrication and application are important in order to incorporate requirements resulting from joining technology, production and material development. Using the latest achievements in joining technology is of great economic significance for the companies involved in joining technology.

As a result of the pace of developments in recent years adhesive bonding technology has become a key technology in many areas. Adhesive bonding is already successfully used in the aircraft industry, the automotive and railway industry, and for shipbuilding and for some constructions in the civil engineering field.

The aim of this project is to increase the competitiveness of European steel pipe industry by developing an innovative and competitive bonding technology for pipes using adhesive bonding technology.

2. PROBLEM DEFINITION

Innovative, versatile and flexible: steel is one of the most important industrial materials. But depending on the application and service requirements also plastics (PE, PVC, GFRP- Glass-Fibre Reinforced Polymers) and concrete are the pipe materials to be considered in the gas and water distribution.

Especially in terms of pressure networks the joints are of highest importance. The main joining techniques for steel pipes are butt welding and mechanical fastening systems. The main problems regarding these conventional techniques are the following:



Mechanical fasteners

Mechanical fasteners distribute the load only over a limited area. Therefore, only parts of the pipe profile can be utilised, and that has a negative effect on joint durability as well as fatigue resistance. Holes inside the joint system can cause problems with corrosion. Loosening and leaking can occur when fastener holes expand due to vibration or flexing. In contrast to adhesive joints conventional pipe fasteners can not transfer axial tension forces [5]. Therefore, abutments are necessary at changes of pipeline direction. Moreover, special high-tensile joint transitions are required at pipeline material transitions in pressure pipe systems in order to realise a tensile force resistance at the pipe joints [5, 35]. Such abutments and high-tensile joint transitions increase both material and labour costs for pipelines with mechanical fasteners. Furthermore, costs for fasteners, tools, sealing devices such as gaskets together with the costs of drilling and tapping holes have to be considered in any case. Additional costs must be calculated for inventorying and stocking a wide variety of components – gaskets, tools, bolts, washers and other parts. All in all, there is a need to develop an efficient and less cost and time consuming alternative for pipe joints.

Welding

The main techniques for welding steel pipes are shielded metal arc welding (SMAW) and gas metal arc welding (GMAW). Independently from the technique used, welding of pipes requires joint preparation. Prior to positioning the pipes for welding, the edges must be bevelled, cleaned and grinded to bright metal. Pre-heating can alleviate hardening problems and residual stress formation and is therefore very important, particularly for pipes with a high wall thickness. The welding process is not only time but also cost consuming. Welding systems require a large capital investment for equipment and continued high maintenance and operating costs. Besides a highly skilled labour force for welding, this joining technique takes a lot of energy which is relatively expensive in Europe. Eye protection and fire hazards are additional financial considerations.

Additionally, welded pipe joints typically need labour-intensive surface finishing processes. Even post-heating is sometimes specified to relieve stresses and help to reduce hardness that may have been caused by rapid cooling. But surface finishing is not only an issue in terms of the weld itself: since about 1960 steel pipes for the water supply are lined with cement mortar [5]. In contrast to adhesive bonding, welding of these pipes requires rework at the cement mortar layer after the joining process. That is both time and cost consuming. Negative contributions to the quality of the environment are the high amounts of welding slag, which is considered a special waste for which a controlled disposal is required.

Despite the technical advances in welding, its principle technological problems remain: the disadvantageous changes in metallurgy and toughness of the steel, residual stresses, shrinkage, et cetera. Moreover, welding can promote corrosion, e.g. pitting corrosion due to weld defect. In this context it should be mentioned that a recent study [17] revealed that in the United States alone the annual direct cost of corrosion only in the gas-distribution network was \$5 billion; and the corresponding corrosion cost for drinking water and sewer systems was \$36 billion per year.

High strength steel

Recent years have seen considerable efforts directed towards using high strength steel in order to reduce pipeline costs. Despite the considerable research work on welding high strength steel in recent years, it remains problematic, expensive and time consuming. High strength consumables with adequate weldability are not common. Welding high strength steel is only possible with very skilled labour and highly advanced and expensive welding equipment with its high energy consumption. Welding high strength steel requires exact processes, including for instance pre-heating which is required to achieve special mechanical properties [8]. Besides that, the technological problems remain, such as hydrogen-cold cracking in the weld material [39]. Generally, the welds are sensitive to undercut, incomplete fusion and porosity. Recent research showed that the yield strength of weld metals of X100 (690 MPa) tends to fall by about 60 MPa for every



1 kJ/mm increase in weld heat input over a wide range of chemical compositions and microstructures [40]. Another problem is that welding higher strength steel requires even a much closer control of welding procedure than had been the case for lower pipe grades [39].

Despite the very successful developments of adhesive bonding in recent years, some engineers still tend to shy away from using adhesive bonding technology due to a historical educational gap in adhesive bonding. Adhesive bonding based on the high developments in the recent years is an innovative new joining technique for steel pipes and can reduce costs significantly. A detailed cost calculation made by the project team of this proposal revealed great cost advantages for adhesively bonded pipe joints compared with conventional welded pipe joints. The aim of this project is to develop an efficient, consistent and integrated process for adhesive bonding of steel pipes. This will open new market shares for the European steel producers.

3. STATE-OF-THE-ART: ADHESIVE BONDING

The following figures reflect the increasing importance of adhesive bonding technology: In 1995, 340 000 tons of adhesives were produced in Germany, whereas in 1999 already 509 000 tons of adhesives were produced only in Germany [24]. Adhesive bonding is a key technology in many areas: In the aircraft construction industry, for instance, adhesive bonding has already a history of about 50 years. Adhesively bonded stiffeners at the vertical tail on the spar in the new Airbus A380 are just one example to underline that adhesive bonding technology is becoming increasingly significant in aircraft construction [27, 20]. Furthermore, adhesive bonding enables modern vehicle approaches in the automotive industry and various improvements compared with conventional joining techniques, including improved corrosion resistance, better resistance to fatigue and better crash performance [11, 34].

Also in civil engineering the adhesive bonding technology becomes more and more important. Adhesively bonded steel bridges which were already constructed in the fifties and sixties of the 20th century and which are still in use show the durability of adhesively bonded joints under environmental influences [10, 21, 36]. Both surface treatment and application of the adhesive for these bridges were done at the construction side [37]. Furthermore, the today's timber constructions are unthinkable without adhesive bonding technology [1]. Even very large wood structures such as bridges and halls made of glue-laminated timber (gluelam) can be built thanks to adhesive bonding. In architecture, adhesive bonding of metallic tubes used for both indoor and outdoor balustrades is already state-of-the-art [28]. It is another example to show that adhesive bonding has proven to be an innovative, reliable and advantageous joining technology.

Publications about adhesive bonding as a repair concept for steel pipes, especially for pipes used for gas distribution, can already be found in the 1970s [18] and 1980s [28, 6]. By replacing welding through adhesive bonding potential problems due to the welding heat and the welding fumes, e.g. fire hazards or explosions, are eliminated.

Adhesively bonded stainless steel pipes were already used in the late 1970s mainly due to corrosion and economic reasons. In [15] the use of an adhesive to bond stainless steel water pipes is compared with the more conventional use of compression or capillary copper fittings together with a soft solder. This research showed that the adhesive joint strengths are much higher than those of conventional compression fittings. Furthermore, these experimental results revealed that a reasonable degree of flexing can be tolerated without leakage and burst strength is described as exceedingly good.

In terms of polymer pipeline construction the adhesive bonding technology is already the most used joining technique next to welding [3]. Adhesively bonded connections in glass reinforced epoxy (GRE) piping systems are being used for a variety of pressure applications offshore and in shipboard applications [16] as well as in district heat supply [25]. Generally, for such applications a save live time for more than 20 years is required. Therefore, these applications reveal the high temperature resistance and durability of adhesively bonded joints even in harsh environments.



For example: adhesively bonded GRE-pipe joints used in the district heat supply are exposed to pressures of 10 bar and water with temperature up to 120 °C [25]. Moreover, adhesively bonded GRE-pipes in the offshore field even resist internal pressures of 100 bar [25]. Applications in the chemical industry show the high resistance of adhesively bonded GRE-pipes against chemicals since such pipes are exposed even to aggressive acids [25]. Despite the very successful developments of adhesive bonding in recent years, this high capacity bonding technology is not yet used for bonding steel pipes.

4. OBJECTIVES AND THE INNOVATIVE CONTENT

The objective of this project is to increase the competitiveness of European steel pipe industry by developing an innovative and competitive adhesive bonding technology for steel pipes distributing gas, water and heat. This requires an innovative adhesive joint design which takes the requirements for a long term use of the pipe (material aging, creep, corrosion) and the requirements for operation and maintenance processes - including piggability and CP for underground lines - into account. A main innovative value of this interdisciplinary project consists of the introduction of the pace developments in adhesive bonding technology of recent years into the steel pipe industry. Since adhesive bonding of steel pipes is a totally new approach compared to the conventional techniques such as welding, it offers new solutions and both economic and technical benefits. Just to mention an example: in contrast to conventional pipelines crack arrestors are not necessary for adhesively bonded pipelines. This alone has an enormous influence on the pipeline costs. In this research work, an efficient, integrated and easy-to-use technique for adhesive bonding of steel pipes will be worked out based on an interdisciplinary collaboration between leading research institutes, steel and adhesive industry, pipe laying companies and end users (Gaz de France) as well as umbrella organisations. Furthermore, new practical guidelines for the workers at the construction site, new design calculation methods (both analytical and numerical) will be developed. Additionally, an innovative non-destructive in-process quality control concept together with a new repair method for adhesively bonded steel pipes will be developed. All these innovations are necessary in order to develop an intergraded new bonding concept which takes the industrial requirements into account. Hence, this research project will lead to significant progress far beyond the state-of-the-art. The project enables new innovative applications for the steel industry.

All in all, this innovative research will broaden the skills of the steel pipe industry and further develop its competence base. This is important in order to take full advantage of the increasing demand of new pipelines for the gas and water distribution. For instance: It is predicted that natural gas consumption will double over the next 20 years [4]. The improvements of living conditions, the global population growth, and last but not least the increasing environmental consciousness increase the need for pipeline constructions.

5. CONSISTENCY OF RESOURCES AND QUALITY OF THE PARTNERSHIP

The projects team includes 8 project partners connecting 5 European countries (Denmark, France, Germany, Italy, and Poland), see Fig. 1. All project partners are leading representatives in their field of work. There is a clear benefit to carry out the proposed work at European level in order to achieve the objectives of this very innovative and interdisciplinary project.



Fig. 1: Project proposal “JoinTec” connects 8 project partners from 5 European Countries.



A consistently interdisciplinary approach is important in order to incorporate requirements resulting from joining technology, pipe production, pipe laying and long term use of pipelines by end users. As mentioned in the *European Steel Technology Platform – From a Strategic Research Agenda to Implementation* (March 2006) “there is need for much closer cooperation between leading suppliers and major construction companies”. This research proposal is taking this need directly into account: The project team comprises the entire product chain by connecting the steel pipe industry (Mannesmann Fuchs Rohr GmbH), the adhesives industry (Sika Danmark A/S) with the pipe laying industry (Bohlen & Doyen Polska Sp. Z o.o.) and the end users (Gaz de France) including leading European research institutions in the steel area (Salzgitter Mannesmann Forschung GmbH, Centro Sviluppo Materiali S.p.A.) and universities (University of Paderborn) specialised in joining techniques as well as umbrella organisations (*Arbeitsgemeinschaft für Wärme- und Heizkraftwirtschaft - AGFW*) for an optimised exchange of the project results. This ensures an optimal implementation of the developed technology and dissemination of the results. The project partners have complementary skills which guarantee the necessary knowledge, laboratories and industrial facilities to ensure that the research will be carried out with the highest competence level in answer to industrial needs. The focus of this new proposal is on joining steel pipes with a diameter d up to 200 mm (main focus: $d=168,3$ mm) for water transportation as well as on joining steel pipes with a diameter up to 600 mm (main focus $d=508$ mm) for the gas, water and heat transportation. The new joint concept will be tested on both small and full scale steel pipes including non-destructive and destructive testing. Transferability of the concept will be verified by practical pipe laying field tests at the construction site. Furthermore, the innovative joining concept will be evaluated and compared with conventional joining techniques in terms of technical and economic aspects. The economic evaluation covers not only costs for the bonding process itself but also for all parts and technical requirements necessary for a long term use of the pipeline. The tasks of the project are divided into five main work packages (WP) covering both development and management work. Each work package has a co-ordinator and is sub-divided into several tasks, see Fig. 2.

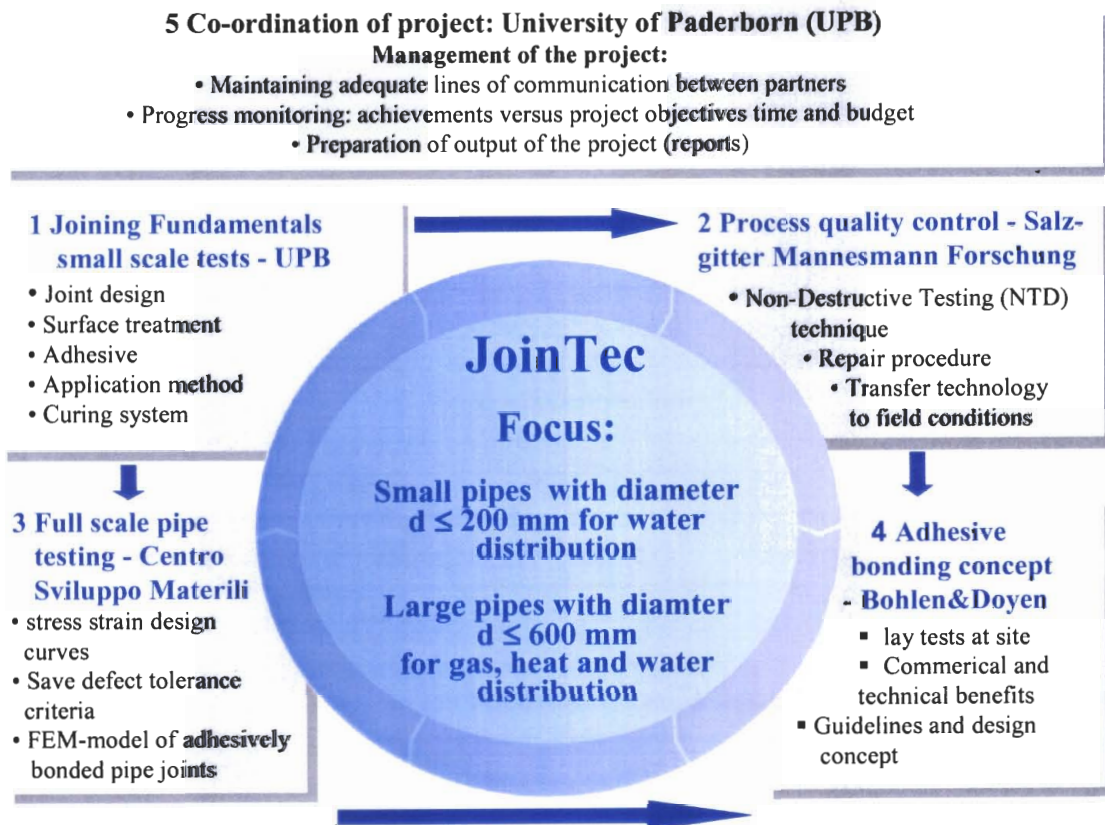


Fig. 2: Work packages with work package leader



6. INDUSTRIAL INTEREST AND SCIENTIFIC/TECHNICAL PROSPECTS

As shown by the strong participation of industrial partners including end users like *Gaz de France* (France) this project has a very clear industrial interest. As part of the preparation for this proposal, the project team made a detailed cost calculation that compares the cost of conventional welded pipe joints with adhesively bonded joints for steel pipes. This comparison revealed that adhesive pipe joints have cost advantages compared with conventional pipe joints.

The construction and infrastructure sector and the energy sector identified as priorities in the Strategic Research Agenda (SRA) are being addressed in this proposal.

Industrial interest / economic benefits

The main objective of this project is to develop an integrated and easy-to-use innovative joining concept in line with the industrial needs of the pipe industry and the latest research in adhesive bonding technology. This easy-to-use joining concept does not require high skilled labour so that labour costs can be reduced. Saving labour costs is essential for the European steel market as a whole in order to be competitive with emerging countries with their lower labour costs. Welding equipment is more expensive to operate than adhesive systems [38]. Moreover, welding systems require a large capital investment for equipment and continued high maintenance and operating costs and require a highly skilled crew; they require more energy and the removal of hazardous fumes. High energy costs for welding are increasingly important cost considerations due to the high energy prices in Europe. Eye protection and fire hazards are additional expenses which can be saved by using adhesive bonding. This will also lead to lower insurance costs.

In contrast to welding adhesively bonded joints have no heat-affected zone since high temperatures are not required in the joining process. The lack of heat distortion eliminates not only the disadvantageous changes in metallurgy but also the need for rework, and reduces the time spent on surface finishing. Time-consuming operations required to remove welding slag and prepare the surface for finishing can be avoided with adhesives. Additionally, the cost and time consuming procedure of finishing the cement mortar layer after welding the joint is not necessary anymore when adhesive bonding is used.

Furthermore, adhesive bonding offers cost benefits over mechanical fasteners because total material costs are lower [38]. In addition to the eliminating of the cost for fasteners, tooling costs associated with the joining operation can be reduced or eliminated as well as costs for sealing devices. Costs of inventorying and stocking a wide variety of components, e.g. bolts, nuts, washers or other parts, can be avoided by using adhesive bonding. In contrast to mechanical fastening, adhesive bonding can eliminate stress concentrations at special points in the pipe joint area so that pipe material can be saved which will reduce costs. Moreover, different from conventional mechanical pipe fasteners adhesive joints can transfer axial tensile forces so that abutments at changes of pipeline direction or special high-tensile mechanical transitions are not required anymore at pipeline material transitions in pressure pipe systems.

Much of the existing pipeline infrastructure is constructed from steel because it is a strong, mechanically robust and still a relatively inexpensive material. However, plastics used for pipelines in the water and gas distribution have gained greater market share in recent years. Between 1990 and 2000, the production of plastic pipes in Western Europe rose from 2,0 to 2,6 Mio. t/a [23]. In the drinking water supply network plastic pipes are mainly used for pipe diameters up to 150 mm. For pipes having a diameter larger than 150 mm steel is the main material. Plastics have a market share (in Germany) of more than 50 % for pipes with a diameter up to 150 mm, while in other European countries this percentage is even higher [23]. Steel as pipe material is losing market shares in this sector due to high costs for laying steel pipes with conventional joining techniques. For instance: for pipes with a diameter of 100 mm the total costs for installing steel pipes are twice as high as for pipes made of plastics [23]. The installation costs mainly depend on the time and costs needed for realising the joints. The development of an innovative and competitive new joining



technology for steel pipes using adhesive bonding reduces these costs. Therefore, it opens new market possibilities for steel pipes and increase the competitiveness of the European steel industry as a whole.

Scientific/technological benefits

Adhesive bonding enables convincing solutions because of advantageous characteristics such as: optimal distribution of stress in joints, capability to join different materials, sealing to liquids and gases, resistance to different media and durability. Additional functions such as reinforcing and anticorrosive functions, vibration damping, noise abating and electrical conductivity can be integrated into the bonded connection by the adhesive. Furthermore, adhesives are capable to adjust tolerances in the pipe joint geometry and movements in the pipeline due to e.g. temperature.

By using adhesive bonding instead of welding the thermal distortion associated with welding is eliminated. There is no heat-affected zone since high temperatures are not required in the joining process. Therefore, there is no reduction of material strength at the joining point [14] and no disadvantageous changes in metallurgy and toughness of the steel (residual stresses, shrinkage, etc.). Steel grades which are not weldable or difficult to weld, e.g. high-strength steel, painted or coated steel, can be easily bonded by adhesives. Another benefit is the improved fatigue strength, especially in low and long-term loading conditions [7], due to low stress concentrations in the joint. Corrosion is another main aspect: Adhesive bonding leads to a reduction of pitting corrosion due to the absence of weld defects and the additional benefit of the adhesive acting as a sealant within a joint, thus minimising crevice corrosion [5].

Using the new developments of adhesive bonding technology can also overcome the problems associated with mechanical fastening of pipes. Since mechanical fasteners only join the assembly at specific points, stress concentrations are created and prevent an optimal use of the pipe geometry. Adhesives produce a molecular bond over the entire joint area, which can result in more strength, improved assembly durability and less failures. Furthermore, adhesives can prevent the loosening and leaking that can occur when fastener holes expand due to vibration or flexing.

Social and environmental benefits

As mentioned in the *European Steel Technology Platform – From a Strategic Research Agenda to Implementation* (March 2006) the grades presently available in terms of exploration, production and transportation systems in the oil & gas industry “might not match the dual target of high productivity and improved levels of safety “. The use of adhesive bonding as joining technology for pipes in gas pipelines leads to considerable improvements of the safety levels. By replacing welding with adhesive bonding welding fumes and potential fire hazards or explosions due to the welding heat are eliminated. In contrast to welding, high temperatures are not required for adhesively bonded pipe joints. Adhesive bonding is a joining method without noise, sparks or dust and eliminates major health hazards. Protection clothes, such as eye protection, are not necessary. This leads to safer working conditions.

The use of adhesive bonding will also make positive contributions to the preservation and improvement of the quality of the environment as significant reduction of welding slag is expected. Welding slag is considered special waste for which a controlled disposal is required.

The introduction of adhesive bonding technology into steel pipe industry will trigger considerable future development far beyond the scope of this project. The new developments in adhesive bonding in recent years will open up new possibilities for the steel industry.



Profiles of Project Partners:

The *Laboratory of Materials and Joining Technologies* (LWF) is a part of the **University of Paderborn**. Its main activity is the creation of scientific guaranteed knowledge in the field of joining techniques, especially adhesive bonding. The Laboratory is playing a leading role in the research field of joining technologies since many years and is well known for its great variety of advanced testing equipment, excellent measurements facilities, and Finite Element simulations.

The Salzgitter AG with its 17.000 employees is ranking among Europe's leading steel technology groups. **Salzgitter Mannesmann Forschung GmbH** is the central research company of the Salzgitter Group and ranks as one of the leading European research institutions in the steel area.

A major energy player in Europe, **Gaz de France** produces, purchases, transports, distributes and sells energy (natural gas, electricity) and related services to all its customers. The Group:

- > operated the largest natural gas transmission system in Europe;
- > managed the largest European natural gas distribution network;
- > was a leading European supplier of natural gas;
- > was one of Europe's largest buyers of natural gas.

Sika is a major player in the adhesive industry with a total of almost 90 production and marketing companies. **Sika Danmark A/S** is the Technology Centre for 2-component polyurethane (2C PU) adhesives within Sika and develops and produces these systems for customers worldwide. Sika Danmark A/S supply structural adhesives for different applications, e.g. blade bonding for wind turbines and sandwich panel bonding.

The main field of activities of **Bohlen & Doyen Polska Sp. Z o.o.** is both construction and maintenance of distribution system. The pipe laying company realise pressure pipelines and the maintenance of gas, water, waste water, power and telecommunication networks since more than 50 years.

Formerly, **Centro Sviluppo Materiali S.p.A.** was a corporate research centre of the Italian public industry, now it is a limited company. The company promotes industrial activities in the field of steel to enhance and develop knowledge. Any type of laboratory materials tests carried out under Quality Assurance warranty (in SINAL-certified laboratories) which includes as well full-scale evaluation of components, such as bending tests on pipelines, "premium" joint evaluation, testing on large valves up to 48", in which CSM enjoys internationally recognised capability and a high reputation.

Mannesmann Fuchs Rohr GmbH is a pipe supplier which produces high frequency inductive longitudinally welded pipes with a maximum wall thickness of 20,6 mm. These HFI-welded tubes can be used as line pipes, oilfield tubes, steel tubes and hollow sections. The products are offered black or with different types of coatings (PE, PP, Epoxy, FCM) and linings (Cement mortar, Epoxy). Due to several product innovations and investments in the past Mannesmann Fuchs Rohr is nowadays one of the leading suppliers of HFI-pipes worldwide.

Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft – AGFW – e. V. bei dem VDEW is an umbrella organisation which comprises energy service providers, pipeline companies, as well as universities, laboratories, testing institutes and companies concerned with development and planning of pipelines. The goal of the AGFW is to ensure an optimal exchange of experience. AGFW therefore prepares technical standards ("AGFW work sheets") with requirements and test procedures also as instructions for the use of the technical solutions. New standards will be worked out with all groups concerned (manufacturer, suppliers, test laboratories and others).



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A3. FOR RESUBMITTED PROPOSALS ONLY: ADDITIONAL INFORMATION

- **Title, reference number and year of the previous submission(s)**

Title: Innovative and competitive new joining technology for steel pipes using adhesive bonding

Reference Number: RFS-PR-05152

Year of Previous Submission: 2005

- **Evaluation report received from the Commission following the last submission**

The evaluation report received from the Commission is attached on the following pages. The evaluation report was used by the project to implement improvements regarding all critical comments mentioned in the report from the Commission.

- **Short description of main changes made, making reference to the comments of the evaluators in the evaluation report**

Due to the high industrial interest in this research topic and regardless that the version of the research proposal was not retained for funding last year (weighted mark 16,33 / 25) the project team went on working on this research topic and the proposal during the last year. A detailed calculation of costs for adhesively bonded pipe joints revealed cost advantages compared with conventional welded pipe joints.

The focus of this new proposal is on joining steel pipes with a diameter d up to 200 mm (main focus $d = 168,3$ mm) for water transportation as well as on joining steel pipes with a diameter up to 600 mm (main focus $d = 508$ mm) for the gas, water and heat transportation. During the last couple of months the project team developed for both the small and large diameter pipes a new, innovative adhesive joint geometry which takes the requirements for a long term use of the pipe (material aging, creep, corrosion) into account (see description of Work Package 1 (WP1) "Joining Fundamentals). Therefore, the other work packages can now already start despite a possible delay in WP1. Thus, the concern mentioned in the paragraph "Consistency of resources and quality of partnership" of the evaluation report that a delay in WP1 would lead to an overall project delay does not apply to this new proposal version.

Additionally, the definition of the Work Packages is partly redefined in this proposal in order to include the new project partners *Gaz de France* (France) and *Mannesmann Fuchs Rohr* (Germany) in the Work Packages and to optimise the project structure. In order to avoid overlaps in the work distribution and capabilities of project partners the entire work regarding the adhesive industry in the actual proposal will be done by *Sika Danmark*. Therefore, in contrast to the proposal version 2005 CR5 (*Bostik*) will not take part in this proposal so that the comment mentioned in the paragraph "Consistency of resources and quality of partnership" of the evaluation report that the proposal failed to justify the differences in manpower and operation costs for CR4&5 does not apply to this actual proposal.

Additionally, the Contractors University of Paderborn and Salzgitter Mannesmann Forschung reduce their budgets by more than 20 % according to the evaluation summary report. The overall budget of the entire project is reduced by more than 20 %.

The project team comprises the entire product chain by connecting the steel pipe industry (Mannesmann Fuchs Rohr) and the adhesive industry (Sika Danmark) with pipe laying industry (Bohlen & Doyen) and the end users (Gaz de France) including leading testing institutes for non-destructive and destructive pipe testing (Centro Sviluppo Materiali, Salzgitter Mannesmann Forschung) and universities (University of Paderborn) as well as umbrella organisations (*Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft*). This ensures an optimal implementation of the developed technology and dissemination of the results. The members of the project team met a couple of times during the last months to optimise the scope and structure of the project in order to achieve the objectives. To sum it up: The project team is prepared and ready to start.

GENERAL PROPOSAL INFORMATION

Proposal Title: Innovative and competitive new joining technology for steel pipes using adhesive bonding

Acronym: JoinTec
Technical Group: TGS8

Project duration (months): 36

Partner Summary

Part n°	Organisation Name	City code	Acti vity	Type	Budget (€)	Funding Requested (€)
1	UNIVERSITÄT-GESAMTHOCHSCHULE PADERBORN	DE	CO	HE	720.910	432.546
2	SALZGITTER MANNESMANN FORSCHUNG GmbH	DE	P	BIN	531.819	319.091
3	BOHLEN & DOYEN POLSKA Sp Z.o.o	PL	P	BIN	202.260	121.356
4	SIKA DANMARKS A/S	DK	P	BIN	205.000	123.000
5	BOSTIK GMBH	DE	P	BIN	186.000	111.600
6	CENTRO SVILUPPO MATERIALI SPA	IT	P	RES	280.000	168.000
7	ARBEITSGEMEINSCHAFT FÜR WÄRME UND HEIZKRAFTWIRTSCHAFT (AGF	DE	P	OTH	16.480	9.888
8	NACAP GMBH	DE	P	BIN	8.790	5.274

Total Project Budget (I): 2.151.259 €
Funding Requested (I): 1.290.755 €

Panel: G

Abstract

This research work will introduce the pace developments in adhesive bonding technology of recent years into the steel pipe industry. The aim of this project is to increase the competitiveness of European steel pipe industry by developing an innovative and competitive bonding technology for steel pipes distributing gas, water and heat.

- Objectives:**
- Elaborating an efficient, integrated and easy-to-use technique for adhesive bonding of steel pipes based on an interdisciplinary collaboration between leading research institutes, adhesive industry and pipe industry.
 - Development and verification of guidelines, design calculation methods and non-destructive testing methods for adhesive bonding steel pipes.

Consolidated Evaluation Summary Report

Scientific and technical approach	Final mark: 4,00 /5
Comments: The project is in line with the RFCS objectives. Methods, techniques and work programme are well described and suited to achieve the project objectives. The state-of-the-art is complete and done in a comprehensive way.	
Innovative content	Final mark: 3,33 /5
Comments: There are elements of innovation in the proposal by applying an existing bonding technique to the steel pipe industry through the development of a more efficient adhesive technology. Potentially, the project will lead to the development of new products and processes applicable to the pipe industry similarly to what is common practice in the automotive or aeronautic industries.	
Consistency of resources and quality of partnership	Final mark: 1,00 /5
Comments: The partnership has the adequate expertise to ensure the success of the project. The work programme is described in detail showing the main contributions of each partner within the different WPs. There is concern that a delay in WP1 will lead to an overall project delay. In light of the work intended, the budget is significantly overestimated. The proposal could only be possibly selected, subject to an overall reduction of more than 20% for CR1&2. Additionally, the proposal fails to justify the differences in manpower and operating costs for CR4&5.	
Industrial interest and scientific/technical prospects	Final mark: 4,00 /5
Comments: There is a clear industrial interest to carry out the proposed work as shown by the strong participation of industrial partners. The project will lead to an increase of competitiveness of the steel industry by offering competitive solutions when compared with the ones provided by the industry of polymers. The project addresses the issue of implementation of the developed technology and the dissemination of the results by involving both supplier of tube and adhesives and the end-users.	
Community added value and contribution to EU policies	Final mark: 4,00 /5
Comments: There is clear benefit to carry out the project at European level. The project is strategic to the steel industry eventually leading to the regain of market share against the polymers. Additionally, the project will have an impact on occupational health by developing a surface treatment in the factory and by avoiding the fumes typical of the welding processes. In energetic terms, the project will lead to a reduced use of energy when compared with the welding techniques.	
Overall	Final mark: 16,33 /25 Weighted mark: 16,33 /25
Comments: The project aims at developing a competitive bonding technology for steel pipes distributing gas, water or heat. The state of the art is complete and comprehensive. The proposal is innovative by applying existing bonding techniques to the steel pipe industry which potentially can lead to regain of market share from the polymers industry. Therefore, the project is highly strategic to the steel pipe industry. The	

(1) These amounts are indicative and do not represent necessarily the final amounts the Commission will use to enter into the negotiation phase should the proposal be retained for funding

EUROPEAN COMMISSION - Research Fund for Coal And Steel
OPEN CALL RFCS - RTD - 2005

Deadline : 15/09/2005

Area : 2

PROPOSAL NUMBER : RFS-PR-05152

work programme is clearly described showing the main contributions of each partner within the different WPs. However, the overall budget is clearly overestimated by more than 20% which seriously reduces the credibility of the proposal.

SAG Advice

Comments: The Advisory Group endorsed the comments of the evaluators.

Not Recommended for Funding



EUROPEAN COMMISSION
RESEARCH DIRECTORATE-GENERAL
Directorate G – Industrial Technologies
Research Fund for Coal and Steel

ANNEX IV

Form 1-1
OBLIGATORY AT THE SUBMISSION STAGE

TECHNICAL ANNEX

Project acronym: JoinTec

Proposal No²:

Contract No:

TITLE:

Innovative and competitive new joining technology for steel pipes using adhesive bonding

OBJECTIVES

WORK PROGRAMME AND DISTRIBUTION OF TASKS

PROGRAMME BAR CHART



OBJECTIVES:

The general aim of the Research Fund for Coal and Steel (RFCS) is to increase competitiveness of the European steel industry. As pointed out in the “European Steel Technology Platform – Vision 2030” (March 2004) an increase in steel market share can be achieved by the use of new bonding technologies.

Joining techniques such as welding, brazing, riveting and screwing are used by industry all over the world on a daily basis. As a result of the very successful developments in recent years a further method of joining is becoming more and more important and is already a key technology in many areas: adhesive bonding.

The main innovative value of this research work is the introduction of the pace developments in adhesive bonding technology of recent years into the steel pipe industry by means of an interdisciplinary European team work between leading companies and research facilities from the steel and adhesive industry area. The focus of this proposal is on joining steel pipes with a diameter d up to 200 mm (main focus $d = 168,3$ mm) for water distribution as well as on joining steel pipes with a diameter up to 600 mm (main focus $d = 508$ mm) for the gas, water and heat transportation. The joining concept will be based on the present pipeline requirements including operation and maintenance processes.

Main objectives:

- Elaborating an efficient, integrated and easy-to-use joining technique for adhesive bonding of steel pipes.
- Development of guidelines, design calculation methods (both analytical and numerical with the Finite Element Method) and non-destructive testing methods including a repair concept for adhesively bonded steel pipes.

Transferability of the elaborated innovative bonding concept including an adequate in-process non-destructive technique for quality control and a repair concept will be verified by pipe laying field tests at the construction site. Additionally, simulation tools for the prediction of the joint's long-term stability will be developed. Furthermore, a detailed cost calculation which will be done at the end of the project to compare this new concept for pipe joints with conventional joining techniques will reveal the economic benefits of this innovative joining concept.

The project team comprises the entire product chain by connecting leading suppliers of both pipes and adhesives with the pipe laying industry and the end users including testing leading institutes for non-destructive and destructive pipe testing and universities as well as umbrella organisations. This ensures an optimal implementation of the developed technology and dissemination of the results. The strong participation of industrial partners reveals the clear industrial interest to carry out the proposed work on European level. The project connects five European countries and eight project partners with complementary profiles. All project partners are leading representatives in their fields of work.

All activities of this project are concentrated on the aim to strengthen the competitiveness of the European steel sector as a whole; at a time where there is an increasing demand on new pipelines for the gas, water and heat distribution. For instance: it is predicted that natural gas consumption will double over the next 20 years. The improvements of living conditions, the global population growth, and last but not least the increasing environmental consciousness is increasing the need for new and safe pipeline constructions.



ANNEX IV
Form 1-2

OBLIGATORY AT THE SUBMISSION STAGE

WORK PACKAGE DESCRIPTION

WP No	1
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Work package Title		Number of man hours²⁹
WP Leader	University of Paderborn (UPB)	5200
Contractor	Salzgitter Mannesmann Forschung GmbH (SZMF)	370
Contractor	Gaz de France (GdF)	10
Contractor	Sika Danmark A/S (SIKA)	750
Contractor	Bohlen & Doyen Polska Sp. Z o.o. (B&D)	100
Contractor	Centro Sviluppo Materiali S.p.A. (CSM)	10
Contractor	Mannesmann Fuchs Rohr GmbH (MFR)	10
Contractor	Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft e.V. (AGFW)	30
Total		6480

1 – Objectives

The main objectives of this work package are the following:

- Survey of main requirements, design standards and of main in-service loading conditions in pipe joints in the gas, water and heat distribution net with regard to adhesive bonding.
- Choice of joint design.
- Development of adequate adhesive.
- Selection of economical and technological beneficial surface treatment.
- Development of easy application method including curing method.



2 - Work programme and distribution of tasks with indication of participating contractors

Task 1.1: Survey of main requirements, design standards and of main in-service loading conditions in pipe joints in the gas and water distribution net with regard to adhesive bonding.

At the beginning of the research project the technical specifications and requirements for adhesively bonded joints in the gas, water and heat distribution net have to be defined in close collaboration with all project partners. The pipe laying company B&D (Bohlen & Doyen Polska Sp. Z o.o.) as well as Gaz de France (end user) and the umbrella organisation AGFW (Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft) will act as consultants in order to provide the other project partners about technical requirements, design standards and their practical experiences and problems in the field of gas, water and heat piping systems made of steel.

This survey including a literature research of the main standard criteria for steel pipe joints forms the foundation for the following tasks. It is also important in order to discuss the geometry of small scale specimens. Simple standard specimens and small scale pipe specimens will be used in this WP. All partners of the WP1 will bring in their individual expertise in Task 1.1.

Task 1.2: Choice of joint design

As the result of adhesive bonding strongly depends on joint design, choice of adhesive, surface preparation, application method and curing concept it is necessary to research all these areas in order to develop a consistent joining concept. This will be done in close collaboration with the adhesive industry (SIKA).

When switching from welding to adhesive bonding, designs must be reviewed and altered. In principle, adhesive bonded joints could be loaded by three main types of stresses: shear, tension, and peel stresses. The goal is to achieve as uniform stress distributions as possible. Adhesive joints should be designed in such a way that the joint is stressed in shear. Peel stresses should be avoided [26]. Therefore, lap joints are the most commonly used adhesive joints and work best with metal applications because the rigid nature of metal substrates helps to achieve a more uniform stress distribution under shear loading.

Fig. 3 on the following page shows a systematisation of possible joint designs for pipes. Beneficial in terms of adhesively bonded pipes are overlapped and tapered joints as well as joints with a coupler [13] because in these cases the adhesive layer is stressed by shear forces (and torsion). The adhesive butt joint is most probably not the appropriate joint design for pipe applications covered by this project because of the small surface area and the normal stresses in the adhesive layer. The different joint designs with lashings (bushings) always need additional joint devices but offer – similar to overlapping joints - a big surface area for the adhesives. The taper/taper joints have the great advantage in comparison to the other joint designs that the stress peaks in the adhesive layer are avoided [13]. Therefore, in principle these joint designs can transfer higher loads. Disadvantageous is the effort to produce the pipes' tapered ends. The widened single lap joints are preferred for pipes with small wall thickness due to industrial/economic interests. Generally, the stress peaks in the adhesive layer in overlapping joints can be reduced by chamfers in order to optimise the stress distribution.

In terms of glass-fibre reinforced polymer (GRRP) pipes where adhesive bonding is already used the joint is typically formed using either a bell system (overlapping joint) or a coupler (single lap – outer) [19].



Task 1.2: Choice of joint design (cont'd)

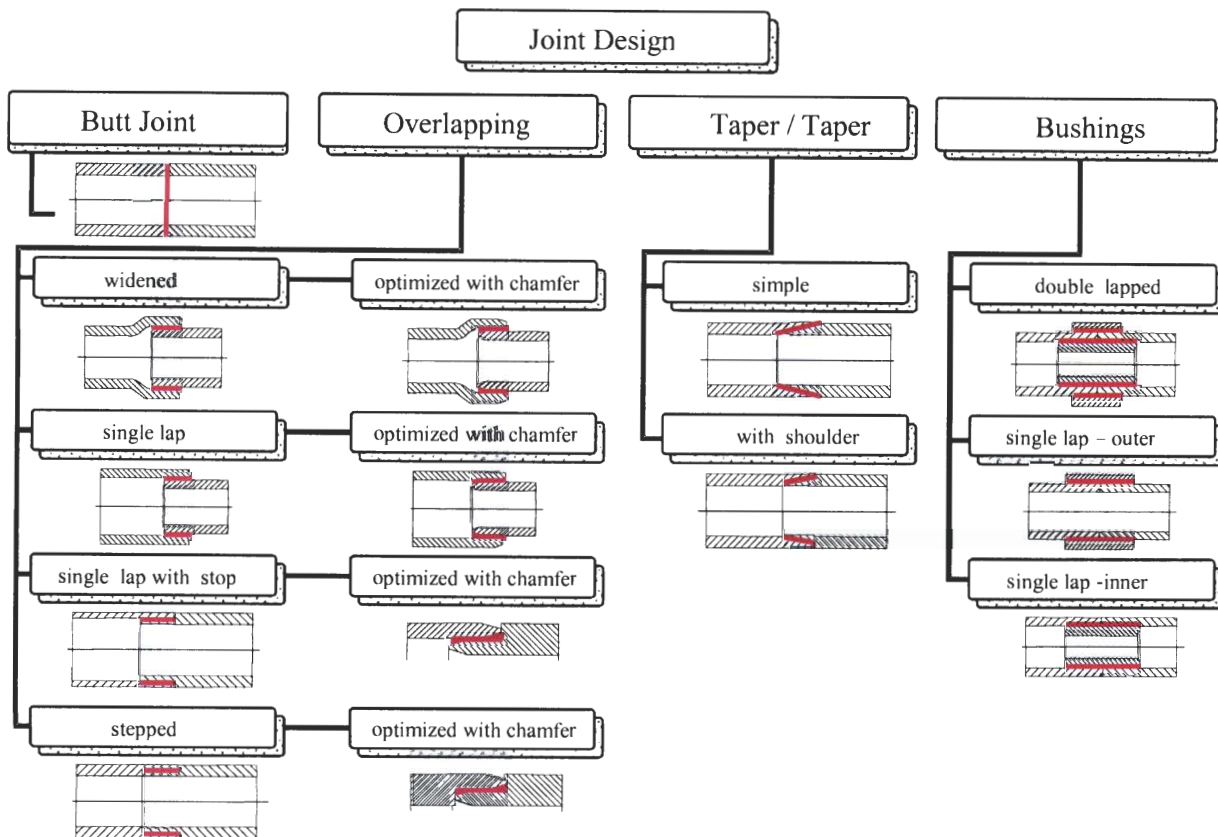


Fig. 3: Systematisation of pipe joint designs [13].

The focus of this new proposal is on joining steel pipes with a diameter d up to 200 mm (main focus: $d = 168,3$ mm) for water transportation as well as on joining steel pipes with a diameter up to 600 mm (main focus $d = 508$ mm) for the gas, water and heat transportation. During the last couple of months the project team developed for both the small and large diameter pipes a new, innovative adhesive joint geometry which takes the requirements for a long term use of the pipe (material aging, creep, corrosion) into account. Fig. 4 shows the developed joint design for the large pipes.

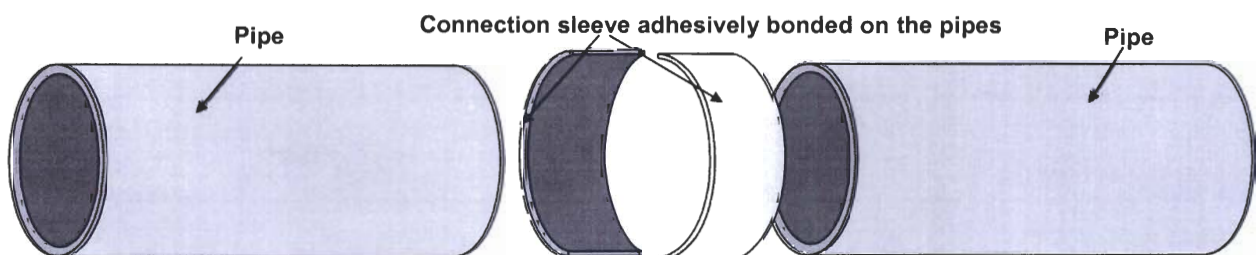


Fig. 4: Developed joint design geometry for steel pipes up to 600 mm in diameter.

The pipes are laid down in a way that they rest against each other. The connection sleeve is divided into two parts in order to ease the joining process. Preliminary stress calculations revealed that the connection sleeve needs a maximum length of 400 mm so that it is overlapping each pipe by 200 mm.



Task 1.2: Choice of joint design (cont'd)

The joint design which will be further evaluated in the research project has to take the present pipeline requirements for operation and maintenance processes (such as piggability and CP for underground lines) into account in order to fulfil the requirements from the end users.

Fig. 5 shows the joint design geometry for the smaller pipes with up to 200 mm in diameter.

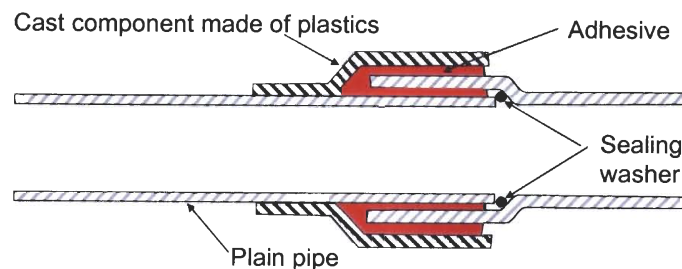


Fig. 5: Developed joint design geometry for steel pipes up to 600 mm in diameter.

The pipe socket which is a cast component made of plastics ensures that the adhesive can be applied easily at the pipe joint. Furthermore, this pipe socket defines the thickness of the adhesive layer. The sealing washers prevent the adhesive from penetrating inside the pipes. Preexaminations done by the project team for the preparation of this proposal pointed out that only an overlapping length of 30 mm is required.

The exact dimensions of these joint geometries will be specified according to the industrial needs by Finite Element simulations (UPB) and by tests on small scale pipes (axial loads, torsion, and pressure) done by SZMF, except dynamic tests which will be done by (UPB). The definition of the exact geometry will be supported by the adhesive industry (SIKA). SIKA will bring in a lot of practical experience since this company supplies already structural adhesives for blade bonding for wind turbines and sandwich panel bonding.

Task 1.2 interrelates with the development of an adequate adhesive. Therefore, on these tasks will be worked simultaneously.

Task 1.3 Development of an adequate adhesive

According to DIN 16920, an adhesive is a non-metal material being able to join adherents by surface adhesion and inner strength. The junction is a result of cohesion and adhesion forces [9]. Engineers can choose the correct product from a great variety of adhesives since 250,000 different adhesives are produced worldwide and about 25000 different adhesive products are available for trade, only in Germany.

Adhesives can be classified in chemically reacting systems and physically reacting adhesives. Chemically reacting adhesives are used for high load assemblies and severe service conditions such as heat, cold or the influence of different mediums. Thus, only chemically reacting adhesives should be considered in this project. In chemically reacting adhesives, there are monomer and pre-polymer molecules ready for reaction in the adhesive layer. They react in the adhesion process with each other under certain conditions, e.g. pressure or temperature, forming polymers in the adhesive splice.



Task 1.3 Development of adequate adhesive (cont'd)

Depending on whether or not the addition of heat is necessary for the curing, chemically reacting adhesives can be divided in cold-setting and hot-setting adhesives. The chemical reactions leading to curing are polymerisation, polyaddition and polycondensation reactions [12, 22], (Fig. 6).

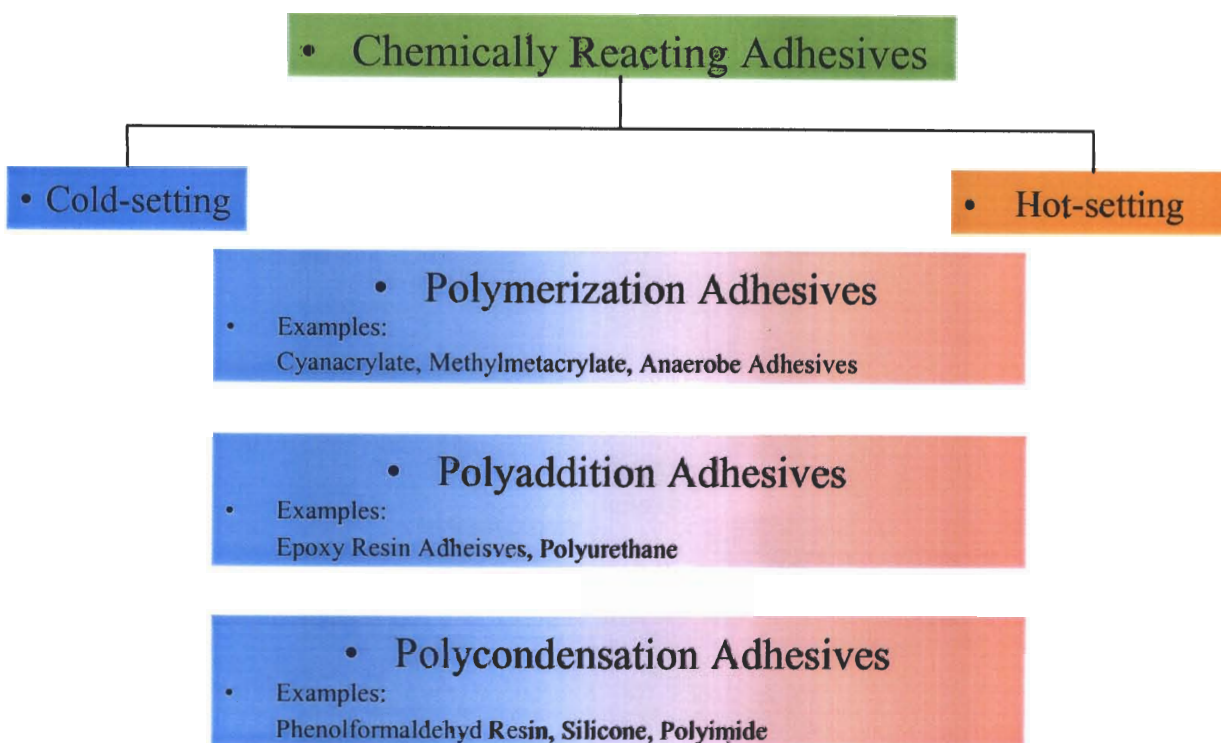


Fig. 6: Chemically reacting adhesives.

For example: polyaddition adhesives based on epoxy resins used in automotive shell construction are hot-setting materials that require temperature above 100°C (212°F) to set. Chemically reactive adhesives can be further subdivided into two groups: one-component systems and two-component systems (mix and no-mix).

One component systems that cure by heat include epoxies, polyurethanes, polyimides and usually consists of two pre-mixed components, which eliminates the need for metering and mixing.

Two component systems come in several forms but usually consist of one part called the adhesive or resin, and a second part called the hardener, catalyst or accelerator. The two components are brought together, i.e. mixed, in a variety of ways, with the mixing starting a chemical reaction, which leads to hardening of the adhesive. Some two component systems do not require careful mixing, such as modified acrylics, in which the accelerator is applied to one surface, adhesive to a second, and the surfaces are joined. Other two-part adhesives, for e.g. some epoxies, often need more accurate mix ratios. Different methods have been developed to help with this mixing, such as pre-measured packs, or cartridges and mixer nozzles. Two component adhesives can cure at room temperature, although some need an elevated temperature to achieve full cure.



Task 1.3 Development of adequate adhesive (cont'd)

Certain technological properties can be achieved by adding different additives and filling materials to the chemically reacting adhesives. New so-called adducts or prepolymers especially suitable for metal bonding have been developed in recent years to further optimise epoxy adhesives [31, 32, 33]. The adhesive formulator can use these components as powerful building blocks in a modular system [2].

Nanotechnology which has become an area of intensive adhesive research in recent years developed methods to synthesise nanosized filler particles which are advantageous in comparison to conventional fillers since much better physical properties of the cured adhesive can be achieved [31]. Recent research even showed that the performance of both one and two component epoxy adhesives can be further improved by combining adducts with these new nanoparticles [31].

For adhesively bonded joints in glass fibre reinforced epoxy (GRE) piping systems used in the oil industry two component epoxy resin adhesives are being used [25]. These GRE-pipes have to resist internal pressures of 100 bar while exposed to water. The most commonly used adhesives for steel joints are epoxy adhesives, modified epoxy adhesives and polyurethane adhesives.

The best adhesive for a given application is generally a function of part design, processing needs and performance requirements. Main performance requirements for this project are durability (material aging, creep, and corrosion), stability against water and gases and an easy handling at the construction site under field conditions. In terms of adhesive bonding of steel pipes which is the scope of this research proposal two component Polyurethanes are the adhesives to be considered. Based on an interdisciplinary research done by the project team as part of the preparation for this proposal the two component adhesive should have an E-Modulus of about 100 MPa, a minimum elongation at fracture of 20 % with a lap shear strength of 10 MPa.

The development and selection of the adhesives will be done by SIKA. This project partner can look back over a long and successful history of structural adhesive bonding and has a great variety of appropriate research capacities. SIKA will approach the project objectives from the chemical point of view.

The selected adhesives will be evaluated by fundamental tests such as adhesion tests, Differential Scanning Calorimetry (DSC) and Dynamic Mechanical Analysis (DMA). This work will be done by UPB. All small specimens tests including shear tests (aged, not-aged), τ - γ tests (aged, not-aged), σ - ϵ tests (aged, not-aged), dynamic strength tests (Woehler) and impact tests on simple overlapping joints (aged, not-aged) will also be done by UPB. All tests on small pipe specimens – also including tests to optimise the processibility - will be done by SZMF except the corrosion test (VDA 621-415), the climate tests (P-VW 1200) and tests on small pipe specimens under impact forces. These three tests will be done by UPB. The tests are essential in order to satisfy the industrial requirements for a long term use of the pipeline.

Based on the analysed test results the adhesives will be further evaluated in the WP2, WP3 and WP4. SIKA will supply all project partners with adhesives they need in order to do their work on this project.



Task 1.4 Selection of economical and technological beneficial surface treatment

Surface preparation is very important because the adhesive “only sees the surface”. Therefore, the strength of a joint strongly depends on the condition of the surfaces. Surface preparation can range from simple cleaning to extensive anodising and priming. The degree of surface preparation depends on the adhesive used, needed performance and service lifetime. Some adhesives are more tolerant of surface oils and require a minimal amount of surface preparation. In general, a clean dry surface is important for achieving maximum bond strength and repeatable environmental durability.

Main applied preparation methods are:

- Degreasing with steam, organic solvents or alkaline cleaners.
- Mechanical methods such as blasting, brushing or grinding with emery-paper.
- Applying a primer.

It has to be taken into account that the adhesive bonding process has to be done at the construction site under field conditions. This requires a tolerant adhesive bonding process, including surface preparation. Adhesively bonded steel bridges constructed already in the fifties and sixties of the 20th century and still in use have proven that adhesive bonding can successfully be done at the construction site under field conditions [21, 36]. However, in terms of adhesive bonding of glass reinforced epoxy (GRE) piping systems it is reported that the surface treatment done outside at the construction site is sometimes problematic due to the weather conditions. Furthermore, it would be time-consuming.

Therefore, the work should be transferred from outside to inside by doing the surface preparation already in the factory and protecting the prepared joints. This method was already successfully applied in 1963 for another adhesively bonded steel bridge: The steel joints were prepared in the factory by sand blasting, before the surfaces were covered by a corrosion protective coating which had not been removed at the construction site [36].

The objective of this part of the project is to develop and verify an effective, easy-to-use, inexpensive and fast surface treatment for the pipe joints. Such an adequate and efficient surface treatment for adhesive bonding of pipes should be transferred from outside to inside the pipe factories. This has also social benefits as the transfer of surface treatment from outside to inside the pipe factory enables improved working conditions due to controlled temperature, humidity and light conditions together with improved ergonomics by allowing easier access to the pipes.

The selection of the surface treatment, e.g. supply of adhesive tapes will be performed by SIKA. UPB will be in charge of simple adhesion tests and tests to determine the contact angle in order to verify the results which will be discussed by all partners in this WP in order to ensure that the developed surface treatment is also beneficial with regard to the requirements at the construction site.

It is worth noting that all tasks of WP1 interrelate with each other.



Task 1.5 Development of easy application method including curing method

After the surface treatment, the adhesive has to be applied to the joints. There are different adhesive application methods, such as brushing, spraying, dipping, roll coating, knife coating and melting. The adhesive has to be distributed as a uniform film with the correct thickness over the entire circumference. Additionally, it is necessary that the adhesive system accommodate variations in gap at the joint arising from normal production tolerances in order to enable a fast installation process.

A simple idea for the application process is to apply the adhesive with a ring shape at the end of one pipe and before the pipe is inserted into a fitting of the other pipe end. This method is already successfully practiced for adhesive bonding of stainless water tubing [15]. Washers can be helpful for the assembly process. They ensure a defined thickness of the adhesive film over the entire radius. Furthermore, washers can help to easily centre the pipes in the correct position and to prevent that the adhesive leaks from the joint. This method using washers is used for both indoor and outdoor adhesively bonded balustrades in architecture [28].

The focus of this project is to develop a competitive joining technique. For this to be achieved, consideration must be given not only to the base cost of the adhesive (which are very low) but also to the simplicity and cost of application process. In order to reduce the costs in comparison to conventional joining techniques, it is important for the adhesive system to allow installation at a comparable or faster rate. The other boundary condition is that reasonable adhesive cost and ease of installation must be accompanied by satisfying service performance. The joint should function as an integrated part of the pipe.

In order to achieve these objectives different adhesive application concepts have to be evaluated. A most probably very good application method in terms of both from a commercial and technological point of view is to inject the adhesive in the joint area by pressure. The use of washers can keep the adhesive in a defined joint area. It is planned that SIKA will be in charge of the application concept supported by UPB. In order to take the situation at the construction site into account the pipe laying industry Bohlen & Doyen Polska Sp. Z o.o. (B&D) and the end users (Gaz de France) together with umbrella organisations (AGFW) will support the work with their experience and requirements.

3 - Interrelation with other work packages

In work package WP1 a consistent preliminary adhesive bonding concept is elaborated on simplified small scale specimens. The results will be evaluated in detail in the following two packages (WP2, WP3) in terms of full scale tests. Additionally, both a repair and an in-process quality control concept will be developed (WP3). Transferability to field conditions of the results will be verified in WP4 by field tests at the construction site. Furthermore, the evaluated experimental test data obtained in WP1 will be used in terms of the FEM calculation concept of adhesively bonded steel pipe joints under real loading conditions, see WP3, Task 3.2.

4 - Deliverables and milestones

The first deliverable is a compilation of main requirements for adhesively bonded steel pipe joints in terms of economic, loading and environmental requirements. The main deliverable is a preliminary adhesive bonding concept. Information will be available about a fundamental qualification of different adhesives, joint designs, surface treatment concepts and adhesive application methods for steel pipe bonding.



ANNEX IV
Form 1-2
OBLIGATORY AT THE SUBMISSION STAGE

WORK PACKAGE DESCRIPTION

WP No	2
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Work package Title		Number of man hours²⁹
WP Leader	Salzgitter Mannesmann Forschung GmbH (SZMF)	2300
Contractor	Gaz de France (GdF)	20
Contractor	Sika Danmark A/S (SIKA)	30
Contractor	Bohlen & Doyen Polska Sp. Z o.o. (B&D)	80
Contractor	Mannesmann Fuchs Rohr GmbH (MFR)	200
Contractor	Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft e.V. (AGFW)	10
Contractor	University of Paderborn (UPB)	200
Total		2840

1 – Objectives

The main objectives of this work package are the following:

- Selection of an adequate NDT method to develop an in-progress quality control concept capable for the application in the field.
- Repair procedure.
- Transfer of the technologies to field conditions.



2 - Work programme and distribution of tasks with indication of participating contractors

Task 2.1 Development of a quality control system (Non-Destructive-Testing, NDT)

The use of adhesive bonding for the joining of pipes in the field will involve a new demand of in-process quality control. Up to now, adhesively bonded joints for non-critical applications are inspected mainly by random samples. In the scope of the requirements with regard to testing time and the environmental conditions in the field, there is evidence of need for an adequate non-destructive technique.

In general, two types of defects may arise in adhesively bonded joints: Those within the adhesive layer itself, like cracks, porosities, poor curing and precuring defects and spurious materials and those within the proximity of the adherent-adhesive interface like uncomplete filling of the bondline, kissing bonds and delaminations. Depending on the size of the defects, a considerable decrease of the bond strength as well as leaking may result.

Many different non-destructive evaluation techniques have been used to detect cracks and other adhesive defects. Those comprises:

- Ultrasonic techniques.
- Vibration techniques.
- Holographic inspection.
- Radiographic inspection.
- Thermographic inspection.
- And more specialised techniques used in the laboratory scale.

The aim of the this part of the project is to select an adequate NDT method, to develop a detailed inspection procedure and to design a concept for a real application in the field, taking into account all necessary boundary conditions. This leads to limitations in the applicability of some techniques that give suitable results only under laboratory conditions (holographic, radiographic techniques). The transfer of the developed techniques to field conditions has to be insured. The procedure will be as described in the following, concentrating on a one side accessibility:

Laboratory: Use of linear ultrasonic inspection (normal incidence)

This method uses the ultrasonic reflectivity at the interfaces as the observable. The main focus lies on the detection of delaminations at the interfaces adherent/adhesive and imperfections in the adhesive layer (porosity cracks etc.):

Instrumental:

- Choice of suitable transducers on piezo basis (normal incidence) for pulse-echo-mode (wave mode, frequency, geometry).
- Choice of suitable transducers on EMAT basis (normal incidence, no coupling medium) for pulse-echo-mode (wave mode, frequency, geometry).
- Development of suitable laboratory inspection mechanics (probe holder, mounting on the pipe) prepared to allow reliable reproducible and complete testing of the bond in the field.



Task 2.1 Development of a quality control system (Non-Destructive-Testing, NTD), (cont'd)

Ultrasonic inspection of bonded plates and pipes in dependence on:

- Wall thickness of the adherends.
- Adhesive.
- Adhesive layer thickness.
- Surface state and surface preparation.
- Artificial defects in/at the adhesive layer.
- The curing state (during and after curing).

Laboratory: Use of nonlinear ultrasonic inspection (normal incidence)

This technique will use shear waves at high inspection frequencies. It uses the transfer from a base frequency to the higher harmonics in the bond as the observable. The main focus lies on the detection of disbonds, voids and cracking.

Instrumental:

- Careful choice of suitable transducers on piezo basis (high power, very linear behaviour, normal incidence)
- Necessary modification of testing mechanics (expected to be minor).

Ultrasonic inspection of bonded plates and pipes in dependence on:

- Steel grade.
- Wall thickness of the adherents.
- Adhesive.
- Adhesive layer thickness.
- Surface state and surface preparation.
- Artificial defects in the adhesive layer interfaces (especially kissing bonds).

Laboratory: Use of linear ultrasonic inspection (oblique incidence)

This method uses the ultrasonic reflectivity at the interfaces as the observable. The main focus lies on the detection of kissing bonds at the interfaces adherend/adhesive.

Instrumental:

- The choice of suitable transducers on piezo basis (frequency, sound field, geometry, oblique incidence).
- Development of suitable laboratory inspection mechanics (probe holder, adjustment of angle of incidence, mounting on the pipe) adapted to the requirements of oblique angle incidence testing.



Task 2.1 Development of a quality control system (Non-Destructive-Testing, NTD), (cont'd)

Ultrasonic inspection of bonded plates and pipes in dependence on:

- Steel grade.
- Wall thickness of the adherents.
- Adhesive.
- Adhesive layer thickness.
- Surface state and surface preparation.
- Artificial defects in the adhesive layer interfaces (especially kissing bonds).
- Transducer characteristics (angle of incidence, frequency, etc.)

Laboratory: Use of ultrasonic surface waves

This method uses the ultrasonic waves with different polarisation directions, travelling along the axial direction. It uses the reflectivity at the interfaces as the observable and offers the possibility to inspect large areas. The main focus lies on the detection of imperfections in the adhesive layer and of delaminations.

Instrumental:

- The choice/development of suitable transducers on EMAT basis (wave mode, polarisation direction).
- Adaptation of the inspection mechanics to the requirements of ultrasonic surface testing.

Ultrasonic inspection of bonded plates and pipes in dependence on:

- Wall thickness of the adherents.
- Adhesive.
- Adhesive layer thickness.
- Surface state and surface preparation.
- Artificial defects in the adhesive layer interfaces.
- Wavelength (frequency) of generated ultrasound.

Laboratory: Thermography and vibration techniques

Thermography is used to inspect the curing procedure of large area bonds. Here the temperature development during the process as well as external excitation (electrical, microwave, light, vibration) can be used. Low frequency vibration methods have a certain potential to detect disbonds in adhesively bonded joints. Those techniques in principal detect local variations in stiffness of a bonded structure (mechanical impedance method) as a consequence of a good and defective area.

All the described techniques will be evaluated. Comparing the results of the different studies and techniques, a decision has to be made which method or combination of methods will be suitable for the application in the field. SZMF will be in charge of this part of the project (Task 2.1).



Task 2.2 Development of a repair procedure

In case a defect has been detected, it has to be decided whether it is tolerable or has to be repaired. In this case a procedure has to be worked out, how a fast and reliable repair can be performed and how eventually the adhesive pipe joint can be separated again. As a basis for the decision, the NDT-methods have to exhibit quantities (i.e. amplitudes, thresholds) determined by the studies on artificial and natural defects, which give a clear and reliable indication of where and how a repair has to be performed.

SZMF will do the work on the development of a repair procedure in the laboratory. The repair procedure will be evaluated mechanically in the next work package (WP3) with destructive tests and from a logistical point of view in WP4 where a practical pipe laying test will be performed. The work on this task will be done by SZMF with main consultancy of SIKA. The necessary full scale pipes will be supplied by MFR.

Task 2.3 Transfer of the technologies to field conditions

All the above mentioned procedures have to consider the situation in the field, which gives limitations to:

- Handling of the pipes.
- Handling of the NDT equipment.
- Education of the inspection people.
- Environmental influences (dirt, water, humidity etc.).
- Spare time for the inspection.

A concept has to be developed, how the methods can be applied to full sized pipes, taking into account:

- The inspection of the whole bonded area without any gaps. This comprises a concept for a robust and field suitable mechanical set-up.
- The application of sensors and transducers: In case of piezo transducers, the question has to be answered how the coupling medium can be applied to the specimen.
- How the results are presented to the inspection engineer (user interface).

The work on this task will be done by SZMF with support of UPB and under consultancy of the pipe laying industry (B&D) and the end users (Gaz de France). All full scale pipes which are necessary for the examinations will be supplied by MFR, (only short parts of pipes are necessary in this work package.)



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3 - Interrelation with other work packages

This work package needs the results coming from WP1. WP2 will not only use the preliminary concept worked out in WP1 on small specimens tests, furthermore it is worth noting that the survey of main requirements for pipe joints in the field and in-service loading conditions (Task 1.1) is essential in order to preselect adequate non-destructive-testing methods and repair methods that are capable to meet the requirements on the construction site. Although, the development of the in-process quality control concept (Task 2.1) can already start right after the survey of the requirements (Task 1.1) as the project team already developed joint geometries for both small and large steel pipes as part of the preparation stage for this proposal. This guarantees a smooth work progress of this project also in case of delay of WP1.

Both the repair method and the non-destructive-testing technique will be verified on a practical pipe laying test in the field which will be performed in WP4. Furthermore, joints with defect for full scale testing in WP3 will be selected and prepared. The results of these tests will have influence on the valuation of the inspection results.

4 - Deliverables and milestones

The aim of work package WP2 is the development of a detailed inspection procedure and the concept for a time and cost saving application method in the field. Therefore, the deliverables will be an evaluation of different inspection procedures in terms of its use for adhesively bonded steel pipe joints. At the end of this work package a suitable non-destructive-testing procedure for adhesive steel pipe joints will be available as well as a reliable repair method for the application in the field.



OBLIGATORY AT THE SUBMISSION STAGE

WORK PACKAGE DESCRIPTION

WP No 3

Work package Title		Number of man hours ²⁹
WP Leader	Centro Sviluppo Materiali S.p.A. (CSM)	4380
Contractor	Mannesmann Fuchs Rohr GmbH (MFR)	300
Contractor	Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft e.V. (AGFW)	10
Contractor	University of Paderborn (UPB)	1500
Contractor	Salzgitter Mannesmann Forschung GmbH (SZMF)	1850
Contractor	Gaz de France (GdF)	10
Contractor	Sika Danmark (SIKA)	20
Total		8070

1 – Objectives

The main objectives of this work package are the following:

- Definition mechanical properties (stress strain design curves) based on a dedicated test program on full scale pipes.
- Save defect tolerance criteria based on a dedicated test program on full scale pipes.
- FEM simulation concept for adhesive pipe joints.



2 - Work programme and distribution of tasks with indication of participating contractors

Task 3.1: Definition mechanical properties (stress strain design curves)

In industrial environment, only limited time is available for the design phase of pipe lines or other constructions. The most efficient material laws from a user point of view are undoubtedly based on tabulated stress-strain curves obtained directly from physical testing. Useful data is necessarily based on experimental material testing.

The general aim of this work package is the definition of mechanical properties and the evaluation of in-service performance of adhesively bonded steel joints in order to derive a criterion for stress/strain design of pipeline made using adhesively bonded joints. To achieve this goal a dedicated test program will be set up and performed in collaboration with both the adhesive industry and the pipeline industry.

The test program will be subdivided in two phases: laboratory tests on small parts of pipe joints and full-scale tests performed on a limited numbers of selected joints. The tests performed on small-scale pipe joints will be executed by SZMF. In parallel, a dedicated full-scale test program will be performed, first, in order to verify the findings made on small-scale specimens and, second, to finally validate the new joint design concept under realistic service conditions. In detail, the full-scale test program will comprise the items listed below:

- Static tensile tests (positive axial force) ...(SZMF)
- Static bending tests ...(CSM)
- Static torsion tests ...(SZMF)
- Static pressure containment tests ...(SZMF)
- Alternating tensile/compression tests (positive/negative axial force) ...(SZMF)
- Cyclic pressure containment tests ...(SZMF)
- Multi-axial testing 1: pressure containment + positive/negative axial force (static and cyclic) ...(SZMF)
- Multi-axial testing 2: pressure containment + bending moment ...(CSM)
- Multi-axial testing 3: pressure containment + torsion ...(SZMF)
- Evaluation of resistance against denting and puncture simulating dynamic external threats such as impact due to mechanical equipment like excavators ...(CSM)

In the above tests, loads and displacements shall be recorded continuously during testing, notably in axial direction directly at the interface between joint and out-bounding pipe. Prototype testing shall neither lead to any form of burst failure nor de-bonding nor leakage.

The full scale test program will be done in joint co-operation of CSM and SZMF, both parties having extensive expertise in this field. CSM can perform its part of the test program making use of existing dedicated facilities like an excavator simulator (suitable for any type of diameter and a maximum length of about 5 m) and readily available equipment for simulating interaction of internal/external pressure and bending loads. Likewise, SZMF is capable of performing its part of the test program independently utilizing approved testing facilities.

The full scale test program in Task 3.1 will be done on selected types of joints (maximum 3 geometries). MFR (Mannesmann Fuchs Rohr) is in charge for the supply of these pipes.



Task 3.2: Save defect tolerance criteria

The above indicated full scale test program will not only be performed on selected kinds of received joints, moreover it is planned to also perform these tests on joints with “defect” and joints damaged by environment and cyclic loads. About this last, a realistic load/environments laboratory cyclic to reproduce the potential in service damage will be fixed under consultancy of pipe laying industry (B&D) and end users (Gaz de France). The experimental tests will be done by CSM. UPB will work out the defect tolerance criteria based on the experimental test data (CSM).

MFR (Mannesmann Fuchs Rohr) is in charge for the supply of the pipes. All joints will be made and inspected by SZMF using the methods developed already in the previous work package WP2.

Task 3.3: FEM simulation concept for adhesive pipe joints

Simulation with the Finite Element Method is state-of-the-art today. Simulation is important to verify construction concepts and to shorten the time used for the design phase.

The aim of this task is to develop a suitable Finite Element calculation concept to simulate adhesive pipe joints. Furthermore, these simulation tools should have the capability to predict the long-term stability of the joint. The result will help design engineers to optimise new pipe geometries. The FE-concept has to take into account not only the mechanical forces, such as axial loads; moreover the properties of the used adhesives under different mediums and temperature have to be modelled. The FE-concept will be worked out by UPB. The simulation concept will be verified by the full scale tests done in this WP. It has to be mentioned that LWF has a great expertise and long-term experience in modelling adhesively bonded joints since UPB is working on the development of FE-calculation concepts together with adhesive industries and end users (such as the automotive industry) since many years.

3 - Interrelation with other work packages (please give WP No)

For the successful competition of this work package the WP1 and WP2 are important and their conclusions are needed. For instance: the joints with “defect” that are tested in Task 3.2 of this WP will be inspected by the non-destructive-testing methods developed in Task 3.1 of the previous WP. The knowledge gained in this WP will be used in WP4 in order to derivate guidelines and a easy-to-use design method for adhesively bonded pipe joints in the gas, water or heat distributing net.

4 - Deliverables and milestones

At the end of this work package a dedicated know-how about the design and inspection of adhesive pipe joints will be available. The stress strain design curves together with a save tolerance criteria as well as a Finite Element calculation concept are main deliverables. This experimental data is obtained under a variety of different loads, typical for the wide range of different load conditions in the gas, water and heat supply industry. A realistic FE-model for adhesively bonded pipes is another important step in order to introduce the developments of adhesive bonding technology of recent years into pipe laying industry.



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Form 1-2

OBLIGATORY AT THE SUBMISSION STAGE

WORK PACKAGE DESCRIPTION

WP No	4
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Work package Title		Number of man hours²⁹
WP Leader	Bohlen & Doyen Polska Sp. Z o.o. (B&D)	1870
Contractor	Centro Sviluppo Materiali S.p.A. (CSM)	10
Contractor	Mannesmann Fuchs Rohr GmbH (MFR)	400
Contractor	Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft e.V. (AGFW)	30
Contractor	University of Paderborn (UPB)	2460
Contractor	Salzgitter Mannesmann Forschung GmbH (SZMF)	40
Contractor	Gaz de France (GdF)	40
Contractor	Sika Danmark A/S (SIKA)	50
Total		4900

1 – Objectives

- Practical pipe laying test at construction site in order to verify the developed adhesive bonding concept under field condition and in order to assess developed adhesive bonding concept against conventional joining techniques
- Detailed cost calculation to compare this new bonding technology for steel pipes with conventional joining techniques.
- Fixing practical guidelines/recommendations and design calculation methods for adhesive bonding of pipes in the gas, water and heat distribution net.



2 - Work programme and distribution of tasks with indication of participating contractors

Task 4.1: Practical pipe laying test at construction site in order to verify the developed adhesive bonding concept under field condition and in order to assess developed adhesive bonding concept against conventional joining techniques

WP4 is scheduled after the first three work packages where a consistent adhesive bonding concept for steel pipes has been elaborated and evaluated with small scale specimens (WP1) over full scale non-destructive-tests (WP2) up to full scale destructive tests and FE-calculations (WP3). Finally, the developed bonding concept will be verified on a practical field lay test at the construction site under field conditions (WP4). The practical pipe laying tests is important because it reveals logistical and technical advantages and disadvantages of the new bonding concept.

The lay test will be done by the pipe-lying company Bohlen & Doyen Polska Sp. Z o.o. (B&D) which have more than 50 years experience in pipe constructions. Mannesmann Fuchs Rohr GmbH (MFR) will supply B&D with the pipes for the pipe laying test at the construction site. The field tests will be done under consultancy of Gaz de France.

Task 4.2: Detailed cost calculation to compare this new bonding technology for steel pipes with conventional joining techniques.

In order show the progressiveness of the developed adhesive bonding concept an assessment of this concept against conventional joining techniques (welding, mechanical fastening) will be performed by UPB based on an analyse of the field tests. This includes a detailed cost calculation done by UPB under consultancy of both B&D and Gaz de France in order to compare the developed new concept with conventional joining techniques. This comparison has to cover not only the costs for the bonding process itself but also for all parts and technical devices necessary for a long term use of the pipeline. Therefore, also present pipeline requirements for operation and maintenance processes such as piggability and CP for underground lines have to be taken into account.

Task 4.3: Defining practical guidelines/recommendations and design calculation methods for adhesive bonding of pipes in the gas, water and heat distribution net

Together with the background of knowledge gained in the first three work packages the evaluation of the practical pipe lying test will be the foundation to derivate practical guidelines for an easy-to-use bonding concept at the construction site. This work will be done by UPB under participation of B&D and Gaz de France. The work in this task will be supported by AGFW. AGFW which is an umbrella organisation ensures an optimal exchange of experience prepares technical standards (“AGFW work sheets”) with requirements and test procedures also as instructions for the use of the technical solutions. New standards will be worked out with all groups concerned (manufacturer, suppliers, test laboratories and others). Before a new standard coming into force the whole branch of industry has the possibility to give their statements to the published working documents.



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3 - Interrelation with other work packages (please give WP No)

This WP will take into account all previous work packages with their analysed results.

4 - Deliverables and milestones

The deliverable of this work package is the presentation of an innovative bonding concept using the latest developments of adhesive bonding in recent years. Furthermore, practical guidelines for adhesive bonding of pipelines will be supplied. Furthermore, a detailed cost calculation will be worked out under consultancy of Gaz de France. This evaluation covers not only costs for the bonding process itself but also for all devices and technical requirements necessary for a long term use of the pipeline. The costs will be compared with the costs for conventional pipe joints.



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OBLIGATORY AT THE SUBMISSION STAGE

WORK PACKAGE DESCRIPTION

WP No	5
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Work package Title	Management and co-ordination of the project	Number of man hours²⁹
WP Leader	University of Paderborn (UPB)	950
Total		950
1 – Objectives		
<ul style="list-style-type: none">• Management and co-ordinations of the project and maintaining adequate lines of communication between all partners in order to achieve the project objectives within the time and budget allocated.• Preparation of the output of the project including the final report.		



2 - Work programme and distribution of tasks with indication of participating contractors

5.1 Management and co-ordinations of the project

Fig. 7 shows the management structure of the project.

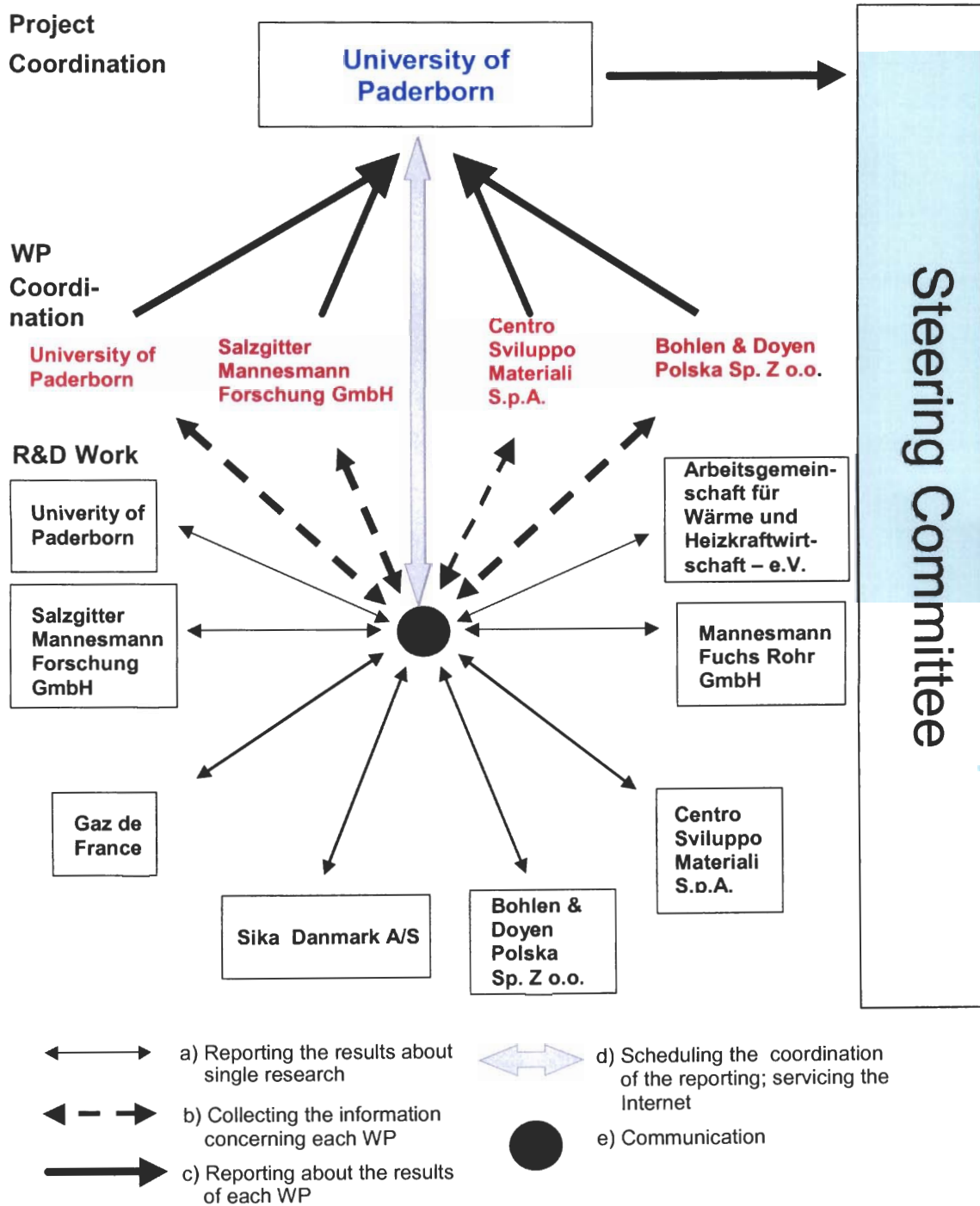


Fig. 7: Management Structure.



5.1 Management and co-ordinations of the project (cont'd)

The project coordinator (LWF) manages the research programme including the financial coordination. Progress will be monitored against the project plans by comparing resources consumed and the technical progress made with the costs and objectives planned in each sub-work package. This will be done twice a year on the occasion of the project meetings to be held in which each coordinator of a sub-work package presents a progress report. Progress reports will summarise technical progress and project expenditure every three months, identify to what extent progress and expenditures are in line, identify any technical difficulties or circumstances likely to affect progress and outline planned activities for next reporting period. The work of each work package will be accompanied and monitored by the Coordinator (LWF). In this way any difficulties can be identified and dealt with when they arise. These reports will be assimilated by the project coordinator and used to compare with the scheduled programme and resource allocation.

Decisions will be made concerning future direction of each partner and action will be taken to rectify any activities where progress is not in line with the programme. The work of each work package will be accompanied and monitored by the Coordinator (LWF).

A steering committee which will be formed by Prof. Dr. Hahn (LWF), Prof. Dr. Niemeyer (SZMF) and Dr. Demofonti (CSM) will meet in the case of major problems during the research work.

LWF which has a long experience in coordination and development of research projects in the field of joining technique is allocating resources and qualified staff for management of the project. Furthermore, the co-ordinator Dipl.-Ing. Wissling (LWF), in particular, brings in also practical experiences from the pipe laying industry since he worked as an engineer on several international pipe laying projects. Before he started his research career at the LWF, Dipl.-Ing. Wissling worked in the Netherlands and the USA for Heerema Marine Contractors (HMC) which is a Dutch company that provides design, transportation and installation services to the international oil and gas industry.

The Europe Liaison Office at the University of Paderborn consults the UPB as the project coordinator in special questions of administrative affairs in order to guarantee an optimal financial coordination and optimal project process. As the Europe Liaison Office is part of the University of Paderborn collaboration is easily possible.

As coordinator his responsibilities for the Consortium and towards the Commission are:

- Collect all reports and documents submitted to the Commission or other participants.
- Collect progress reports.
- Send all cost statements and consortium agreements.
- Ensure prompt payment of financial contributions.
- Verify timetable in the way that milestones are met.
- Review project progress in the way that economic and technical objectives and targets are met.
- Solve possible problems arising from administrative, contractual or partnership issues
- Organisation of meetings.
- Provision of meeting minutes and follows up of agreed actions.

The progress monitoring may require coordinator visits to different partners when major task is executed (large scale testing on pipes) or prior to milestones of key deliverables.



5.1 Management and co-ordinations of the project (cont'd)

Communication structure:

Internet based project centre will be launched for collecting reports and related information. This centre will be linked to e-mail which notifies added documents and reports. Proactive frequent informal communication between participants is encouraged via e-mail.

Next to the normal meetings additional meetings may be called when urgent problems arise and solving of them is needed. In order to save time and travelling resources, some of those meetings will be held via e-mail ballot and confirming conference call or internet-assisted meeting when all partners may discuss and select one of their screens to watch (e-meeting). In addition to official meetings, the facilities can be used within technical discussions with smaller number of participants.

5.2 Preparation of the output of the project

Every month the WP leader will assess and report on the progress of task in his WP. Possible deviations from the detailed project plan will be reported. Proposals for corrective action to ensure that key deliverables and milestones are met. Every six months progress report will be circulated that contains summary of all work carried out in the previous six-month period.

After 18 months, a report which covers the whole first period of the project will be prepared. The expenditure of funding is included and comparison to allocation in the budget is done by each participant. This report is also mid term review of the project, where critical examination of results available is done reflecting the resources and allocated costs.

3 – Interrelation with other work packages

WP1-WP4: management and co-ordination of the project

4 - Deliverables and milestones

Progress reports, progress meetings, final report, etc.



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**CONTRACTOR PROFILE/INFORMATION
(1 FORM PER PARTICIPANT)**

Project Acronym ¹	JoinTec		Proposal No ²	
Legal information on the participating organisation				
Contractor Role ³	CO		Contractor No ⁴	1
Full Official Denomination ⁵	Universität Paderborn			
Organisation short name or Acronym (if relevant)	UPB			
Legal form (fully written) ⁶	Higher Education		Legal form abbreviation ⁷	HE
Legal Registration No ⁸	N/A		VAT No ⁹	DE811209907
Place of Registration ¹⁰	N/A			
Activity type ¹¹	SME	Yes	Entity Type ¹²	GOV
		No		
Full Official address of the contractor				
PO Box ¹³				
Street Name and Number	Warburger Strasse 100			
Post Code ¹⁴	33098	Cedex ¹⁵		
Town/City	Paderborn	Country name	Germany	
Internet homepage				
Authorised administrative person for the purpose of contract signature¹⁷				
Title (Dr, Prof., etc.)				
Function ¹⁸	Head of Administration			
Family Name	Plato			
First Name (Forename)	Juergen			
Telephone No ¹⁹	(49-5251) 602558	Fax No ¹⁹	(49-5251) 60482558	
E-mail	plato@zv.uni-paderborn.de			



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Address of the main Institute/Department/Laboratory carrying out the work			
Institute/Department/ Laboratory Name ¹⁶	Laboratorium für Werkstoff- und Fuegetechnik (LWF)		
PO Box ¹³			
Post Code ¹⁴	33098	Cedex ¹⁵	
Town/City	Paderborn	Country name	
Internet homepage			
Scientific person in charge of the project			
Title (Dr, Prof., etc.)	Prof. Dr.		
Function ¹⁸	Chair of research group		
Family Name	Hahn		
First Name (Forename)	Ortwin		
Telephone No ¹⁹	(49-5251)603030	Fax No ¹⁹	(49-5251)603239
E-mail	Ortwin.Hahn@lwf.uni-paderborn.de		
Authorised contact person			
Title (Dr, Prof., etc.)	Dipl.-Ing.		
Function ¹⁸	Postgraduate		
Family Name	Wissling		
First Name (Forename)	Matthias		
Telephone No ¹⁹	(49-5251)603037	Fax No ¹⁹	(49-5251)603239
E-mail	Matthias.Wissling@lwf.uni-paderborn.de		



OBLIGATORY AT THE SUBMISSION STAGE

**CONTRACTOR PROFILE/INFORMATION
(1 FORM PER PARTICIPANT)**

Project Acronym ¹	JoinTec		Proposal No ²	
Legal information on the participating organisation				
Contractor Role ³	CR		Contractor No ⁴	2
Full Official Denomination ⁵	Salzgitter Mannesmann Forschung GmbH			
Organisation short name or Acronym (if relevant)	SZMF			
Legal form (fully written) ⁶	Gesellschaft mit beschränkter Haftung	Legal form abbreviation ⁷	GmbH	
Legal Registration No ⁸	HRB9622	VAT No ⁹	DE 813 077 888	
Place of Registration ¹⁰	Rome			
Activity type ¹¹	SME	Yes	Entity Type ¹²	PRC
IND		No X		
Full Official address of the contractor				
PO Box ¹³				
Street Name and Number	Eisenhüttenstraße 99			
Post Code ¹⁴	38239	Cedex ¹⁵		
Town/City	Salzgitter	Country name	Germany	
Internet homepage				
Authorised administrative person for the purpose of contract signature¹⁷				
Title (Dr, Prof., etc.)	Prof. Dr.			
Function ¹⁸	Geschäftsführer (Managing director)			
Family Name	Niemeyer			
First Name (Forename)	Matthias			
Telephone No ¹⁹	+39 0650551	Fax No ¹⁹	+49 5341 21 2727	
E-mail	m.niemeyer@sz.szmf.de			



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Address of the main Institute/Department/Laboratory carrying out the work			
Institute/Department/ Laboratory Name ¹⁶	Salzgitter Mannesmann Forschung GmbH		
PO Box ¹³			
Post Code ¹⁴	47259	Cedex ¹⁵	
Town/City	Duisburg	Country name	Germany
Internet homepage			
Scientific person in charge of the project			
Title (Dr, Prof., etc.)	Dr.		
Function ¹⁸	Head of Department Nondestructive Testing		
Family Name	Orth		
First Name (Forename)	Thomas		
Telephone No ¹⁹	+49 203 999 3234	Fax No ¹⁹	
E-mail	t.orth@du.szmf.de		
Authorised contact person			
Title (Dr, Prof., etc.)	Dr.		
Function ¹⁸	Head of Department Nondestructive Testing		
Family Name	Orth		
First Name (Forename)	Thomas		
Telephone No ¹⁹	+49 203 999 3234	Fax No ¹⁹	
E-mail	t.orth@du.szmf.de		



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**CONTRACTOR PROFILE/INFORMATION
(1 FORM PER PARTICIPANT)**

Project Acronym ¹	JoinTec		Proposal No ²	
Legal information on the participating organisation				
Contractor Role ³	CR	Contractor No ⁴	3	
Full Official Denomination ⁵	Gaz de France – Direction de la Recherche			
Organisation short name or Acronym (if relevant)	GDF - DR			
Legal form (fully written) ⁶	Société anonyme	Legal form abbreviation ⁷	S.A.	
Legal Registration No ⁸	542.107.651	VAT No ⁹	FR 13542107651	
Place of Registration ¹⁰	Paris			
Activity type ¹¹	SME	Yes	Entity Type ¹²	PRC
IND		No✓		
Full Official address of the contractor				
PO Box ¹³	BP33			
Street Name and Number	361 avenue du président Wilson			
Post Code ¹⁴	93211	Cedex ¹⁵		
Town/City	St Denis la Plaine	Country name	FRANCE	
Internet homepage	www.gazdefrance.com			
Authorised administrative person for the purpose of contract signature¹⁷				
Title (Dr, Prof., etc.)	Engineer			
Function ¹⁸	Transmission Program Manager			
Family Name	Altmayer			
First Name (Forename)	Philippe			
Telephone No ¹⁹	+33(0)149225419	Fax No ¹⁹	+33(0)149225653	
E-mail	philippe.altmayer@gazdefrance.com			



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Address of the main Institute/Department/Laboratory carrying out the work			
Institute/Department/ Laboratory Name ¹⁶	GDF – Direction de la Recherche - Pôle Techniques de Transport 361 avenue du président Wilson		
PO Box ¹³	BP33		
Post Code ¹⁴	93211	Cedex ¹⁵	
Town/City	St Denis la Plaine	Country name	FRANCE
Internet homepage			
Scientific person in charge of the project			
Title (Dr, Prof., etc.)	Engineer		
Function ¹⁸	Project Manager		
Family Name	Wolvert		
First Name (Forename)	Geoffray		
Telephone No ¹⁹	+33(0)149225016	Fax No ¹⁹	+33(0)149225891
E-mail	geoffray.wolvert@gazdefrance.com		
Authorised contact person			
Title (Dr, Prof., etc.)	Engineer		
Function ¹⁸	Project Manager		
Family Name	Wolvert		
First Name (Forename)	Geoffray		
Telephone No ¹⁹	+33(0)149225016	Fax No ¹⁹	+33(0)149225891
E-mail	geoffray.wolvert@gazdefrance.com		



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**CONTRACTOR PROFILE/INFORMATION
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Project Acronym ¹	JoinTec	Proposal No ²	
Legal information on the participating organisation			
Contractor Role ³	CR	Contractor No ⁴	4
Full Official Denomination ⁵	Sika Danmark A/S		
Organisation short name or Acronym (if relevant)	Sika		
Legal form (fully written) ⁶	Aktieselskab	Legal form abbreviation ⁷	A/S
Legal Registration No ⁸	55188114	VAT No ⁹	55188114
Place of Registration ¹⁰	ToldSkat, Nordsjaelland-Bornholm		
Activity type ¹¹	SME	<input checked="" type="checkbox"/> Yes	Entity Type ¹² PRC
		<input type="checkbox"/> No	
Full Official address of the contractor			
PO Box ¹³	Sika Danmark A/S		
Street Name and Number	Praestemosevej 2-4		
Post Code ¹⁴	3480	Cedex ¹⁵	+4548188496
Town/City	Fredensborg	Country name	Denmark
Internet homepage	www.sika.dk		
Authorised administrative person for the purpose of contract signature¹⁷			
Title (Dr, Prof., etc.)			
Function ¹⁸	General Manager		
Family Name	Nielsen		
First Name (Forename)	Henrik		
Telephone No ¹⁹	+4548188585	Fax No ¹⁹	+4548188496
E-mail	nielsen.henrik@dk.sika.com		



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Address of the main Institute/Department/Laboratory carrying out the work			
Institute/Department/ Laboratory Name ¹⁶	Sika Danmark A/S		
PO Box ¹³			
Post Code ¹⁴	Praestemosevej 2-4 3480	Cedex ¹⁵	+4548188496 (fax)
Town/City	Fredensborg	Country name	Denmark
Internet homepage	www.sika.dk		
Scientific person in charge of the project			
Title (Dr, Prof., etc.)	Chem.eng		
Function ¹⁸	R&D Manager		
Family Name	Kirketerp		
First Name (Forename)	Karen		
Telephone No ¹⁹	+4548188585	Fax No ¹⁹	+4548188496
E-mail	kirketerp.karen@dk.sika.com		
Authorised contact person			
Title (Dr, Prof., etc.)	Chem.eng.		
Function ¹⁸	R&D Manager		
Family Name	Kirketerp		
First Name (Forename)	Karen		
Telephone No ¹⁹	+4548188585	Fax No ¹⁹	+4548188496
E-mail	kirketerp.karen@dk.sika.com		



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**CONTRACTOR PROFILE/INFORMATION
(1 FORM PER PARTICIPANT)**

Project Acronym ¹	JoinTec	Proposal No ²	
Legal information on the participating organisation			
Contractor Role ³	CR	Contractor No ⁴	5
Full Official Denomination ⁵	Bohlen & Doyen Polska Sp. Z o.o. Ul. Piastowska 10b / 8 66-300 Miedzyszcz / Poland		
Organisation short name or Acronym (if relevant)			
Legal form (fully written) ⁶	Sp. Z o.o.	Legal form abbreviation ⁷	SPÓŁKI Z OGRANICZONĄ ODPOWIEDZIALNOŚCIĄ
Legal Registration No ⁸	KRS: 0000092942	VAT No ⁹	NIP: 783-15-62-750
Place of Registration ¹⁰	Sąd Rejonowy Poznań / XXI Wydział Gospodarczy Krajowego Rejestru Sądowego Ul. Zmartwychwstańców 9 / 61-501 Poznań		
Activity type ¹¹	SME	Yes	Entity Type ¹² PRC
IND		No X	
Full Official address of the contractor			
PO Box ¹³			
Street Name and Number	Ul. Piastowska 10b / 8		
Post Code ¹⁴	66-300	Cedex ¹⁵	
Town/City	Miedzyszcz	Country name	Poland
Internet homepage			
Authorised administrative person for the purpose of contract signature¹⁷			
Title (Dr, Prof., etc.)	Dipl.- Ing.		
Function ¹⁸	Director pipeline Devision		
Family Name	Wegener		
First Name (Forename)	Hartmut		
Telephone No ¹⁹	+48 95 7421719	Fax No ¹⁹	+48 95 7421719
E-mail	h.wegener@bohlen-doyen.com		



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Address of the main Institute/Department/Laboratory carrying out the work			
Institute/Department/ Laboratory Name ¹⁶	Bohlen & Doyen Polska Sp. Z o.o. Ul. Piastowska 10b / 8		
PO Box ¹³			
Post Code ¹⁴	66-300	Cedex ¹⁵	
Town/City	Miedzyrzecz	Country name	Poland
Internet homepage			
Scientific person in charge of the project			
Title (Dr, Prof., etc.)	Dipl.- Ing.		
Function ¹⁸	Projectmanager		
Family Name	Behrendes		
First Name (Forename)	Erwin		
Telephone No ¹⁹	+48 95 7421719	Fax No ¹⁹	+48 95 7421719
E-mail	e.behrendes@bohlen-doyen.com		
Authorised contact person			
Title (Dr, Prof., etc.)	Dipl.- Ing.		
Function ¹⁸	Projectmanager		
Family Name	Behrendes		
First Name (Forename)	Erwin		
Telephone No ¹⁹	+48 95 7421719	Fax No ¹⁹	+48 95 7421719
E-mail	e.behrendes@bohlen-doyen.com		



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**CONTRACTOR PROFILE/INFORMATION
(1 FORM PER PARTICIPANT)**

Project Acronym ¹	JoinTec	Proposal No ²	
Legal information on the participating organisation			
Contractor Role ³	CR	Contractor No ⁴	6
Full Official Denomination ⁵	Centro Sviluppo Materiali S.p.A.		
Organisation short name or Acronym (if relevant)	CSM		
Legal form (fully written) ⁶	Società per Azioni	Legal form abbreviation ⁷	S.p.A.
Legal Registration No ⁸	269973	VAT No ⁹	00903541001
Place of Registration ¹⁰	Rome		
Activity type ¹¹	SME	Yes	Entity Type ¹² PRC
RES		No X	
Full Official address of the contractor			
PO Box ¹³			
Street Name and Number	Via di Castel Romano 100		
Post Code ¹⁴	00128	Cedex ¹⁵	
Town/City	Rome	Country name	Italy
Internet homepage	www.c-s-m.it		
Authorised administrative person for the purpose of contract signature¹⁷			
Title (Dr, Prof., etc.)	Dr		
Function ¹⁸	Chief Executive Officer		
Family Name	BRUNO		
First Name (Forename)	Roberto		
Telephone No ¹⁹	+39 0650551	Fax No ¹⁹	+39 065055300
E-mail			



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Address of the main Institute/Department/Laboratory carrying out the work			
Institute/Department/ Laboratory Name ¹⁶	Centro Sviluppo Materiali Via di Castel Romano, 100		
PO Box ¹³			
Post Code ¹⁴	00128	Cedex ¹⁵	
Town/City	Rome	Country name	Italy
Internet homepage	www.c-s-m.it		
Scientific person in charge of the project			
Title (Dr, Prof., etc.)	Dr.		
Function ¹⁸	Senior Researcher		
Family Name	Demofonti		
First Name (Forename)	Giuseppe		
Telephone No ¹⁹	+39-06-5055456	Fax No ¹⁹	+39-06-5055452
E-mail	g.demofonti@c-s-m.it		
Authorised contact person			
Title (Dr, Prof., etc.)	Dr.		
Function ¹⁸			
Family Name	Mazzarano		
First Name (Forename)	Andrea		
Telephone No ¹⁹	+39 065055383	Fax No ¹⁹	+39 065055300
E-mail	A.MAZZARANO@C-S-M.IT		



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**CONTRACTOR PROFILE/INFORMATION
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Project Acronym ¹	JoinTec	Proposal No ²	
Legal information on the participating organisation			
Contractor Role ³	CR	Contractor No ⁴	7
Full Official Denomination ⁵	Mannesmann Fuchs Rohr GmbH		
Organisation short name or Acronym (if relevant)			
Legal form (fully written) ⁶	Gesellschaft mit beschränkter Haftung	Legal form abbreviation ⁷	GmbH
Legal Registration No ⁸	HRB 1435	VAT No ⁹	DE 811151335
Place of Registration ¹⁰	Amtsgericht Siegen, Germany		
Activity type ¹¹ IND	SME	Yes	Entity Type ¹² PRC
		No X	
Full Official address of the contractor			
PO Box ¹³	Postfach 120152		
Street Name and Number	In der Steinwiese 31		
Post Code ¹⁴	57074	Cedex ¹⁵	
Town/City	Siegen	Country name	Germany
Internet homepage	www.mannesmann-fuchs.com		
Authorised administrative person for the purpose of contract signature¹⁷			
Title (Dr, Prof., etc.)			
Function ¹⁸	Managing Director		
Family Name	Winkels		
First Name (Forename)	Jörn		
Telephone No ¹⁹	+49 2381 420 400	Fax No ¹⁹	+49 2381 420 404
E-mail	joern.winkels@mannesmann-fuchs.com		



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Address of the main Institute/Department/Laboratory carrying out the work			
Institute/Department/ Laboratory Name ¹⁶	Mannesmann Fuchs Rohr GmbH		
PO Box ¹³	Postfach 1713		
Post Code ¹⁴	59061	Cedex ¹⁵	
Town/City	Hamm	Country name	Germany
Internet homepage	www.mannesmann-fuchs.com		
Scientific person in charge of the project			
Title (Dr, Prof., etc.)	Dr.		
Function ¹⁸	R&D Engineer		
Family Name	Hendrik		
First Name (Forename)	Löbbecke		
Telephone No ¹⁹	+49 2381 420 442	Fax No ¹⁹	+49 2381 420 454
E-mail	hendrik.loebbecke@mannesmann-fuchs.com		
Authorised contact person			
Title (Dr, Prof., etc.)	Dr.		
Function ¹⁸	R&D Engineer		
Family Name	Hendrik		
First Name (Forename)	Löbbecke		
Telephone No ¹⁹	+49 2381 420 442	Fax No ¹⁹	+49 2381 420 454
E-mail	hendrik.loebbecke@mannesmann-fuchs.com		



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**CONTRACTOR PROFILE/INFORMATION
(1 FORM PER PARTICIPANT)**

Project Acronym ¹	JoinTec	Proposal No ²	
Legal information on the participating organisation			
Contractor Role ³	CR	Contractor No ⁴	8
Full Official Denomination ⁵	Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft – AGFW – e. V. bei dem VDEW (German Heat and Power Association)		
Organisation short name or Acronym (if relevant)			
Legal form (fully written) ⁶	Association (Eingetragener Verein)	Legal form abbreviation ⁷	e. V.
Legal Registration No ⁸	VR 6146	VAT No ⁹	
Place of Registration ¹⁰	Amtsgericht Frankfurt am Main		
Activity type ¹¹	OTH	Yes	Entity Type ¹² PNP
		No	
Full Official address of the contractor			
PO Box ¹³			
Street Name and Number	Stresemannallee 28		
Post Code ¹⁴	D-60596	Cedex ¹⁵	
Town/City	Frankfurt am Main	Country name	Germany
Internet homepage	www.agfw.de		
Authorised administrative person for the purpose of contract signature¹⁷			
Title (Dr, Prof., etc.)	Dipl.-Ing.		
Function ¹⁸	Manager		
Family Name	Lutsch		
First Name (Forename)	Werner		
Telephone No ¹⁹	+49 69 / 63 04 - 278	Fax No ¹⁹	+49 69 / 63 04 - 458
E-mail	w.lutsch@agfw.de		



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Address of the main Institute/Department/Laboratory carrying out the work			
Institute/Department/ Laboratory Name ¹⁶	Technical and Norms department		
PO Box ¹³			
Post Code ¹⁴	D-60596	Cedex ¹⁵	
Town/City	Frankfurt am Main	Country name	Germany
Internet homepage	www.agfw.de		
Scientific person in charge of the project			
Title (Dr, Prof., etc.)	Dipl.-Ing.		
Function ¹⁸	Deputy Head of Technical and Norms department		
Family Name	Besier		
First Name (Forename)	Rolf		
Telephone No ¹⁹	+49 69 / 63 04 - 346	Fax No ¹⁹	+49 69 / 63 04 - 455
E-mail	r.besier@agfw.de		
Authorised contact person			
Title (Dr, Prof., etc.)	Dipl.-Ing.		
Function ¹⁸	Deputy Head of Technical and Norms department		
Family Name	Besier		
First Name (Forename)	Rolf		
Telephone No ¹⁹	+49 69 / 63 04 - 346	Fax No ¹⁹	+49 69 / 63 04 - 455
E-mail	r.besier@agfw.de		



OBLIGATORY AT THE SUBMISSION STAGE

Project acronym:

Proposal number:

COST SUMMARY IN EURO AFTER NEGOTIATION

Contractor No	Contractor Role	Connection	Organisation short name or Acronym	Equipment (I)	Staff (II)	Overheads (III)	Travel and subsistence (a)	Assistance from third parties (b)	Other operating costs (c)	Operating costs (a+b+c=IV)	Total costs (I+II+III+IV)	Contribution requested from the Community
1	CO		University of Paderborn	3.000	274.900	82.470	5.500	0	156.395	161.895	522.265	313.359
2	CR		Salzitter Mannesman Forschung GmbH	32.400	207.701	62.310	6.000	0	113.755	119.755	422.167	253.300
3	CR		Gaz de France	0	8.240	2.472	4.500	0	0	4.500	15.212	9.127
4	CR		Sika Danmark A/S	0	87.500	26.250	0	0	71.000	71.000	184.750	110.850
5	CR		Bohlen & Doyen Polska Sp. Z o.o.	0	102.200	30.660	4.500	7.500	57.400	69.400	202.260	121.356
6	CR		Centro Sviluppo Materiali S.p.A.	0	169.524	50.857	10.000	0	49.619	59.619	280.000	168.000
7	CR		Mannesmann Fuchs Rohr GmbH	0	40.500	12.150	7.000	0	33.000	40.000	92.650	55.590
8	CR		Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft e.V.	0	4.400	1.320	4.000	0	0	4.000	9.720	5.832
TOTAL				35.400	894.965	268.489	41.500	7.500	481.169	530.169	1.729.024	1.037.414



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Form 4-2

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Equipment and Staff costs details

Contractor role ³	CO	Contractor n° ⁴	1
Full official denomination ⁵	University of Paderborn		

Equipment (Euro)²¹

Description ²²	Date of purchase	Utilisation period (months) [A] ²³	Depreciation period (months) [B] ²⁴	Cost of purchase [C] ²⁵	% allocation to the project [D] ²⁶	Amount charge to project ²⁷ [(A/B)xCxD]
Processing machines for adhesive application		36	60	10.000	0,5	3.000
Total (I)						3.000

Staff

Staff categories ²⁸	N° of man hours ²⁹ [WH]	Hourly rate (Euro) ²⁹ [S/PT]	Staff amount (Euro) ²⁹ [WHxS/PT]
1. (Professor)	150	54	8.100
1. (Doctoral research fellow)	4.460	35	156.100
2. (Technical employees)	3.000	27	81.000
3. (Student assistant)	2.700	11	29.700
Total (II)			274.900
Overheads³⁰ (30% to be systematically applied) Total (III)			82.470



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Form 4-3

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰
Operating costs details

Contractor role ³	CO	Contractor n° ⁴	1
Full official denomination ⁵	University of Paderborn		

Travel and subsistence (Euro)³¹	
Total (a)	5.500

Other operating costs (Euro)³³	
The raw materials employed	5.000
Minor items of regular consumption (material for surface treatment, adhesives, cleaning supplies)	4.500
The use of consumable items	
simple shear specimens	4.500
τ - γ -specimens	8.000
σ - ϵ -specimens	250
peeling specimens	250
Energy (directly used for the project)	200
The maintenance or repair of equipment specifically used for the project	
The transport of equipment or products for and in the course of the project	4.000
The alteration and transformation of existing equipment to the extent necessary for the proper	14.000
IT services	5.780
The rent of equipment specifically used for the project	1.000
Miscellaneous analyses	5.000
Special examinations and tests	
Adhesive:	
Adhesion tests	1.280
surface treatment tests (determination of contact angle)	5.000
Differential Scanning Calorimetry (DTA)	12.000
Dynamic mechanical analysis (DMA)	12.000
Strength of simplified joints:	
simple shear tests (not aged and aged)	2.950
τ - γ -tests (not aged and aged)	185
σ - ϵ -tests	1.470
Peeling tests (not aged and aged)	1.470
Strength (dynamic, Woehler)	15.000
Strength (impact forces)	3.600
Tests (small pipe specimens)	
Strength (impact forces)	3.360
Corrosion test (VDA 621-415)	27.420
Climate influence (P-VW 1200)	18.180
Total (c)	156.395
Operating costs (Euro)³⁴	
Total (IV) = (a + b + c)	161.895



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Form 4-4

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Total costs and revenue

Contractor role ³	CO	Contractor n° ⁴	1
Full official denomination ⁵	University of Paderborn		

Total costs (Euro)

Total costs (I + II + III + IV)	522.265
--	----------------

Revenue (Euro)

Contribution requested from the Community ³⁵	313.359
Own resources	208.906
Other resources (origin and amount in Euro)	0
Total	522.265



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Participant Profile/Information (1 form per participant)²⁰

Equipment and Staff costs details

Contractor role ³	CR	Contractor n° 4	2
Full official denomination ⁵	Salzgitter Mannesmann Forschung GmbH		

Equipment (Euro)²¹

Description ²²	Date of purchase	Utilisation period (months) [A] ²³	Depreciation period (months) [B] ²⁴	Cost of purchase [C] ²⁵	% allocation to the project [D] ²⁶	Amount charge to project ²⁷ [(A/B)xCxD]
Special ultrasonic electronics with phase-sensitive heterodyne receiver and accessories		36	60	60000	90%	32400,00
Data acquisition and evaluation system		36	60	6000	100%	3600,00
Total (I)						32400,00

Staff

Staff categories ²⁸	N° of man hours ²⁹ [WH]	Hourly rate (Euro) ²⁹ [S/PT]	Staff amount (Euro) ²⁹ [WHxS/PT]
Researcher (site Duisburg)	2100	52,54	110334,00
Technical staff (site Duisburg)	1400	35,40	49560,00
Researcher (site Salzgitter)	610	54,84	33452,40
Technical staff (site Salzgitter)	450	31,90	14355,00
Total (II)			207701,40
Overheads³⁰ (30% to be systematically applied) Total (III)			62310,42



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ANNEX IV
Form 4-3

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰
Operating costs details

Contractor role ³	CR	Contractor n° 2	2
Full official denomination ⁵	Salzgitter Mannesmann Forschung GmbH		

Travel and subsistence (Euro)³¹

Total (a)	6000,00
------------------	----------------

Other operating costs (Euro)³³

The raw materials employed (plates, transducer design and construction, mechanics)	20.000,00
Minor items of regular consumption	7.000,00
The use of consumable items	
transducers	5.000,00
sensors	3.000,00
other	3.000,00
Energy (directly used for the project)	
The maintenance or repair of equipment specifically used for the project	8.000,00
The transport of equipment or products for and in the course of the project	8.000,00
The alteration and transformation of existing equipment to the extent necessary for the proper	18.000,00
IT services	
The rent of equipment specifically used for the project	-
Miscellaneous analyses	3.000,00
Special examinations and tests	
Torsion (aged-not aged)	1.225,00
σ - ϵ -tests	1.470,00
Strength (dynamic, Woehler)	28.560,00
Test to optimize joint design	5.000,00
Test to optimize processibility	2.500,00
Total (c)	113755,00

Operating costs (Euro)³⁴

Total (IV) = (a + b + c)	119755,00
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Form 4-4

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Total costs and revenue

Contractor role ³	CR	Contractor n° ⁴	2
Full official denomination ⁵	Salzgitter Mannesmann Forschung GmbH		

Total costs (Euro)

Total costs (I + II + III + IV)	422166,82
--	------------------

Revenue (Euro)

Contribution requested from the Community ³⁵	253300,09
Own resources	168866,73
Other resources (origin and amount in Euro)	0
Total	422166,82



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Form 4-2

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Equipment and Staff costs details

Contractor role ³	CR	Contractor n° ⁴	3
Full official denomination ⁵	Gaz de France		

Equipment (Euro)²¹

Description ²²	Date of purchase	Utilisation period (months) [A] ²³	Depreciation period (months) [B] ²⁴	Cost of purchase [C] ²⁵	% allocation to the project [D] ²⁶	Amount charge to project ²⁷ [(A/B)xCx D]
Total (I)						0

Staff

Staff categories ²⁸	N° of man hours ²⁹ [WH]	Hourly rate (Euro) ²⁹ [S/PT]	Staff amount (Euro) ²⁹ [WHxS/PT]
Scientific Person	80	103	8240
			0
			0
			0
			0
Total (II)			8240
Overheads³⁰ (30% to be systematically applied) Total (III)			2472



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OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Operating costs details

Contractor role ³	CR	Contractor n° ⁴	3
Full official denomination ⁵	Gaz de France		

Travel and subsistence (Euro)³¹

Total (a)	4500
------------------	-------------

Assistance from third parties (Euro)³²

Name of subcontractor or type of cost (e.g. audit or financial guarantee)	Work description	Amount (Euro)
1.		
2.		
3.		
4.		
Total (b)		0

Other operating costs (Euro)³³

The raw materials employed	
Minor items of regular consumption	
The use of consumable items	
Energy (directly used for the project)	
The maintenance or repair of equipment specifically used for the project	
The transport of equipment or products for and in the course of the project	
The alteration and transformation of existing equipment to the extent necessary for the proper performance of the project	
IT services	
The rent of equipment specifically used for the project	
Miscellaneous analyses	
Special examinations and tests	
Total (c)	0

Operating costs (Euro)³⁴

Total (IV) = (a + b + c)	4500
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Form 4-4

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Total costs and revenue

Contractor role ³	CR	Contractor n° ⁴	3
Full official denomination ⁵	Gaz de France		

Total costs (Euro)

Total costs (I + II + III + IV)	15212
--	--------------

Revenue (Euro)

Contribution requested from the Community ³⁵	9127,2
Own resources	6084,8
Other resources (origin and amount in Euro)	
-	
-	
-	
Total	15212



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Form 4-2

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Equipment and Staff costs details

Contractor role ³	CR	Contractor n° ⁴	4
Full official denomination ⁵	Sika Danmark A/S		

Equipment (Euro)²¹						
Description ²²	Date of purchase	Utilisation period (months) [A] ²³	Depreciation period (months) [B] ²⁴	Cost of purchase [C] ²⁵	% allocation to the project [D] ²⁶	Amount charge to project ²⁷ [(A/B)xCx D]
Total (I)						0

Staff			
Staff categories ²⁸	N° of man hours ²⁹ [WH]	Hourly rate (Euro) ²⁹ [S/PT]	Staff amount (Euro) ²⁹ [WHxS/PT]
1. Manager	50	300	15000
2. Scientific Person	500	100	50000
3. Technical Staff	300	75	22500
			0
			0
Total (II)			87500
Overheads³⁰ (30% to be systematically applied) Total (III)			26250



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Form 4-3

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Operating costs details

Contractor role ³	CR	Contractor n° ⁴	4
Full official denomination ⁵	Sika Danmark A/S		

Travel and subsistence (Euro)³¹

Total (a)

Travel costs are included in the hourly rate

Assistance from third parties (Euro)³²

Name of subcontractor or type of cost (e.g. audit or financial guarantee)	Work description	Amount (Euro)
1.		
2.		
3.		
4.		
Total (b)		0

Other operating costs (Euro)³³

The raw materials employed	9000
Minor items of regular consumption	5000
The use of consumable items	1000
Energy (directly used for the project)	
The maintenance or repair of equipment specifically used for the project	3000
The transport of equipment or products for and in the course of the project	3000
The alteration and transformation of existing equipment to the extent necessary for the proper performance of the project	3000
IT services	7000
The rent of equipment specifically used for the project	
Miscellaneous analyses	
Special examinations and tests	40000
Total (c)	71000
Operating costs (Euro)³⁴	
Total (IV) = (a + b + c)	71000



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Form 4-4

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Total costs and revenue

Contractor role ³	CR	Contractor n° ⁴	4
Full official denomination ⁵	Sika Danmark A/S		

Total costs (Euro)

Total costs (I + II + III + IV)	184750
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Revenue (Euro)

Contribution requested from the Community ³⁵	110850
Own resources	73900
Other resources (origin and amount in Euro)	
-	
-	
-	
Total	184750



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Form 4-2

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰
Equipment and Staff costs details

Contractor role ³	CR	Contractor n ^o 4	5
Full official denomination ⁵	Bohlen & Doyen Polska Sp. Z o.o.		

Equipment (Euro)²¹						
Description ²²	Date of purchase	Utilisation period (months) [A] ²³	Depreciation period (months) [B] ²⁴	Cost of purchase [C] ²⁵	% allocation to the project [D] ²⁶	Amount charge to project ²⁷ [(A/B)xCx D]
						0
Total (I)						0

Staff			
Staff categories ²⁸	N ^o of man hours ²⁹ [WH]	Hourly rate (Euro) ²⁹ [S/PT]	Staff amount (Euro) ²⁹ [WHxS/PT]
1. Scientific person	500	70	35000
2. Technical staff	600	55	33000
3. Manual Labour	950	36	34200
Total (II)			102200
Overheads³⁰ (30% to be systematically applied) Total (III)			30660



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OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Operating costs details

Contractor role ³	CR	Contractor n° ⁴	5
Full official denomination ⁵	Bohlen & Doyen Polska Sp. Z o.o.		

Travel and subsistence (Euro)³¹

Total (a)	4500
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Assistance from third parties (Euro)³²

Name of subcontractor or type of cost (e.g. audit or financial guarantee)	Work description	Amount (Euro)
1. RAS	High Pressure test on construction side	7500
2.		
3.		
4.		
Total (b)		7500

Other operating costs (Euro)³³

The raw materials employed	4000
Minor items of regular consumption	2500
The use of consumable items	2600
Energy (directly used for the project)	4500
The maintenance or repair of equipment specifically used for the project	2500
The transport of equipment or products for and in the course of the project	5000
The alteration and transformation of existing equipment to the extent necessary for the proper performance of the project	2800
IT services	
The rent of equipment specifically used for the project	5000
Miscellaneous analyses	3500
Special examinations and tests	25000
Total (c)	57400

Operating costs (Euro)³⁴

Total (IV) = (a + b + c)	69400
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Form 4-4

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Total costs and revenue

Contractor role ³	CR	Contractor n° ⁴	5
Full official denomination ⁵	Bohlen & Doyen Polska Sp. Z o.o.		

Total costs (Euro)

Total costs (I + II + III + IV)	202260
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Revenue (Euro)

Contribution requested from the Community ³⁵	121356
Own resources	80904
Other resources (origin and amount in Euro)	0
-	
-	
-	
Total	202260



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Form 4-2

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Equipment and Staff costs details

Contractor role ³	CR	Contractor n° ⁴	6
Full official denomination ⁵	Centro Sviluppo Materiali S.p.A.		

Equipment (Euro)²¹						
Description ²²	Date of purchase	Utilisation period (months) [A] ²³	Depreciation period (months) [B] ²⁴	Cost of purchase [C] ²⁵	% allocation to the project [D] ²⁶	Amount charge to project ²⁷ [(A/B)xCxD]
						0
Total (I)						0

Staff			
Staff categories ²⁸	N° of man hours ²⁹ [WH]	Hourly rate (Euro) ²⁹ [S/PT]	Staff amount (Euro) ²⁹ [WHxS/PT]
1. Staff with university or equivalent training	3800	39,96	151848
2. Technical staff: <i>Technicians</i>	600	29,46	17676
Total (II)			169524
Overheads³⁰ (30% to be systematically applied) Total (III)			50857,20



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OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰
Operating costs details

Contractor role ³	CR	Contractor n° ⁴	6
Full official denomination ⁵	Centro Sviluppo Materiali S.p.A.		

Travel and subsistence (Euro)³¹	
Total (a)	10000

Assistance from third parties (Euro)³²		
Name of subcontractor or type of cost (e.g. audit or financial guarantee)	Work description	Amount (Euro)
1.		
2.		
3.		
4.		
Total (b)		0

Other operating costs (Euro)³³	
The raw materials employed	-
Minor items of regular consumption	3000
The use of consumable items	-
Energy (directly used for the project)	-
The maintenance or repair of equipment specifically used for the project	-
The transport of equipment or products for and in the course of the project	3000
The alteration and transformation of existing equipment to the extent necessary for the proper performance of the project	-
IT services	-
The rent of equipment specifically used for the project	-
Miscellaneous analyses	43619
Special examinations and tests	-
Total (c)	49619
Operating costs (Euro)³⁴	
Total (IV) = (a + b + c)	59619



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Form 4-4

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Total costs and revenue

Contractor role ³	CR	Contractor n° ⁴	6
Full official denomination ⁵	Centro Sviluppo Materiali S.p.A.		

Total costs (Euro)

Total costs (I + II + III + IV)	280000,2
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Revenue (Euro)

Contribution requested from the Community ³⁵	168000,12
Own resources	112000,08
Other resources (origin and amount in Euro)	0
-	
-	
-	
Total	280000,2



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OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Equipment and Staff costs details

Contractor role ³	CR	Contractor n° ⁴	7
Full official denomination ⁵	Mannesmann Fuchs Rohr GmbH		

Equipment (Euro)²¹						
Description ²²	Date of purchase	Utilisation period (months) [A] ²³	Depreciation period (months) [B] ²⁴	Cost of purchase [C] ²⁵	% allocation to the project [D] ²⁶	Amount charge to project ²⁷ [(A/B)xCx D]
Total (I)						0

Staff			
Staff categories ²⁸	N° of man hours ²⁹ [WH]	Hourly rate (Euro) ²⁹ [S/PT]	Staff amount (Euro) ²⁹ [WHxS/PT]
1. Scientific	600	55	33000
2. Manual Labour	300	25	7500
3.			0
			0
			0
Total (II)			40500
Overheads³⁰ (30% to be systematically applied) Total (III)			12150



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Participant Profile/Information (1 form per participant)²⁰

Operating costs details

Contractor role ³	CR	Contractor n° ⁴	7
Full official denomination ⁵	Mannesmann Fuchs Rohr GmbH		

Travel and subsistence (Euro)³¹

Total (a)	7000
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Assistance from third parties (Euro)³²

Name of subcontractor or type of cost (e.g. audit or financial guarantee)	Work description	Amount (Euro)
1.		
2.		
3.		
4.		
Total (b)		0

Other operating costs (Euro)³³

approx. 300 m pipes with d = 508 mm	25000
approx. 100 m pipes with d = 168,3 mm	3000
Semifinished parts for coupling device	2000
Additional material testing	3000
-	
-	
-	
-	
-	
-	
-	
-	
Total (c)	33000

Operating costs (Euro)³⁴

Total (IV) = (a + b + c)	40000
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Participant Profile/Information (1 form per participant)²⁰

Total costs and revenue

Contractor role ³	CR	Contractor n° ⁴	7
Full official denomination ⁵	Mannesmann Fuchs Rohr GmbH		

Total costs (Euro)

Total costs (I + II + III + IV)	92650
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Revenue (Euro)

Contribution requested from the Community ³⁵	55590
Own resources	37060
Other resources (origin and amount in Euro)	0
-	
-	
-	
Total	92650



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Form 4-2

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Equipment and Staff costs details

Contractor role ³	CR	Contractor n° ⁴	8
Full official denomination ⁵	Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft - AGFW - e. V. bei dem VDEW		

Equipment (Euro)²¹						
Description ²²	Date of purchase	Utilisation period (months) [A] ²³	Depreciation period (months) [B] ²⁴	Cost of purchase [C] ²⁵	% allocation to the project [D] ²⁶	Amount charge to project ²⁷ [(A/B)xCxD]
Total (I)						0

Staff			
Staff categories ²⁸	N° of man hours ²⁹ [WH]	Hourly rate (Euro) ²⁹ [S/PT]	Staff amount (Euro) ²⁹ [WHxS/PT]
1.Scientific Person	80	55	4400
			0
			0
			0
			0
Total (II)			4400
Overheads³⁰ (30% to be systematically applied) Total (III)			1320



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Participant Profile/Information (1 form per participant)²⁰
Operating costs details

Contractor role ³	CR	Contractor n° ⁴	8
Full official denomination ⁵	Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft - AGFW - e. V. bei dem VDEW		

Travel and subsistence (Euro)³¹	
Total (a)	4000

Assistance from third parties (Euro)³²		
Name of subcontractor or type of cost (e.g. audit or financial guarantee)	Work description	Amount (Euro)
1.		
2.		
3.		
4.		
Total (b)		0

Other operating costs (Euro)³³	
The raw materials employed	
Minor items of regular consumption	
The use of consumable items	
Energy (directly used for the project)	
The maintenance or repair of equipment specifically used for the project	
The transport of equipment or products for and in the course of the project	
The alteration and transformation of existing equipment to the extent necessary for the proper performance of the project	
IT services	
The rent of equipment specifically used for the project	
Miscellaneous analyses	
Special examinations and tests	
Total (c)	0
Operating costs (Euro)³⁴	
Total (IV) = (a + b + c)	4000



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Form 4-4

OBLIGATORY AT THE SUBMISSION STAGE

Participant Profile/Information (1 form per participant)²⁰

Total costs and revenue

Contractor role ³	CR	Contractor n° ⁴	8
Full official denomination ⁵	Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft - AGFW - e. V. bei dem VDEW		

Total costs (Euro)

Total costs (I + II + III + IV)	9720
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Revenue (Euro)

Contribution requested from the Community ³⁵	5832
Own resources	3888
Other resources (origin and amount in Euro)	0
-	
-	
-	
Total	9720



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ANNEX IV

Form 7

OBLIGATORY AT THE SUBMISSION STAGE

Certified Declaration by each participant (including the coordinator)

I **certify** that the information relating to our organisation set out in Forms 1-1 to 6 (and in the legal entity and financial identification forms) of the Submission and/or (*cross as appropriate*) Contract Preparation Forms is accurate and correct, that the estimated costs meet the criteria for eligible costs for Research Fund for Coal and Steel projects, as established by the point 3.6 of the legal basis of the programme (Annex to Council Decision of 1 February 2003 laying down the multiannual guidelines for the research programme of the Research Fund for Coal and Steel) and normal cost accounting principles and that they reflect the estimated costs expected to be incurred in carrying out the work described herein.

I also certify that

<i>Full official denomination</i> ⁵	Universität Paderborn
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- is committed to participate in the above mentioned project;
- has stable and sufficient sources of funding to maintain its activity throughout its participation in the project and to provide any counterpart funding necessary.
- has or will have the resources as and when needed to carry out its involvement in the above mentioned project.

As required by Article 93 of Council Regulation (EC, Euratom) N° 1605/2002 of 25 June 2002 on the Financial Regulation applicable to the general budget of the European Communities [OJ L248, 16.09.2002, p. 1], I certify that none of the following cases apply to our organisation:

- a) it is bankrupt or being wound up, is having its affairs administered by the courts, has entered into an arrangement with creditors, has suspended business activities, is the subject of proceedings concerning those matters, or is in any analogous situation arising from a similar procedure provided for in national legislation or regulations;
- b) it has been convicted of an offence concerning its professional conduct by a judgement which has the force of res judicata;
- c) it has been guilty of grave professional misconduct proven by any means which the contracting authority can justify;
- d) it has not fulfilled obligations relating to the payment of social security contributions or the payment of taxes in accordance with the legal provisions of the country in which it is established or with those of the country of the contracting authority or those of the country where the contract is to be performed;
- e) it has been the subject of a judgement which has the force of res judicata for fraud, corruption, involvement in a criminal organisation or any other illegal activity detrimental to the Communities' financial interests;
- f) following another procurement procedure or grant award procedure financed by the Community budget, it has been declared to be in serious breach of contract for failure to comply with its contractual obligations.



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Form 7

OBLIGATORY AT THE SUBMISSION STAGE

I **understand** that any potential contractor who has committed an irregularity in the implementation of any other contract financed by the European Communities budget may be excluded from the selection procedure at any time.

I **enclose** an **external audit report** unless otherwise provided on(please, specify date) to the Research Fund for Coal and Steel Programme as requested by article 173(4) of the Commission Regulation³⁹ laying down detailed rules for the implementation of Council Regulation (EC, Euratom) No 1605/2002 on the Financial Regulation applicable to the general budget of the European Communities. *(not applicable for public bodies)*


The participant organisation is **aware** that:

- any potential contractor who can not certify that none of the above situations apply, shall be excluded from participation in any future contract;
- any potential contractor having been found guilty of misrepresentation in supplying the information required as a condition for participation in the contract or failing to supply such information shall be excluded from participation in any future contract.

I have, previously or currently submitted this proposal or one similar in content to a Commission Programme in a previous call? **Yes**

If **Yes**, please give details of the proposal:

Programme name	RFCS Steel	Year	2005	Proposal No	RFS – PR - 05152
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Name Plato	First name Jürgen
Date (DD/MM/YYYY) 17.9.2006	Signature of person(s) authorised to commit the organisation 



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Form 7

OBLIGATORY AT THE SUBMISSION STAGE

Certified Declaration by each participant (including the coordinator)

I **certify** that the information relating to our organisation set out in Forms 1-1 to 6 (and in the legal entity and financial identification forms) of the Submission and/or (*cross as appropriate*) Contract Preparation Forms is accurate and correct, that the estimated costs meet the criteria for eligible costs for Research Fund for Coal and Steel projects, as established by the point 3.6 of the legal basis of the programme (Annex to Council Decision of 1 February 2003 laying down the multiannual guidelines for the research programme of the Research Fund for Coal and Steel) and normal cost accounting principles and that they reflect the estimated costs expected to be incurred in carrying out the work described herein.

I also certify that

Full official denomination⁵ | *Salzgitter Mannesmann Forschung GmbH*

- is committed to participate in the above mentioned project;
- has stable and sufficient sources of funding to maintain its activity throughout its participation in the project and to provide any counterpart funding necessary.
- has or will have the resources as and when needed to carry out its involvement in the above mentioned project.

As required by Article 93 of Council Regulation (EC, Euratom) N° 1605/2002 of 25 June 2002 on the Financial Regulation applicable to the general budget of the European Communities [OJ L248, 16.09.2002, p. 1], I certify that none of the following cases apply to our organisation:

- a) it is bankrupt or being wound up, is having its affairs administered by the courts, has entered into an arrangement with creditors, has suspended business activities, is the subject of proceedings concerning those matters, or is in any analogous situation arising from a similar procedure provided for in national legislation or regulations;
- b) it has been convicted of an offence concerning its professional conduct by a judgement which has the force of *res judicata*;
- c) it has been guilty of grave professional misconduct proven by any means which the contracting authority can justify;
- d) it has not fulfilled obligations relating to the payment of social security contributions or the payment of taxes in accordance with the legal provisions of the country in which it is established or with those of the country of the contracting authority or those of the country where the contract is to be performed;
- e) it has been the subject of a judgement which has the force of *res judicata* for fraud, corruption, involvement in a criminal organisation or any other illegal activity detrimental to the Communities' financial interests;
- f) following another procurement procedure or grant award procedure financed by the Community budget, it has been declared to be in serious breach of contract for failure to comply with its contractual obligations.



EUROPEAN COMMISSION
RESEARCH DIRECTORATE-GENERAL

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Form 7

OBLIGATORY AT THE SUBMISSION STAGE

I **understand** that any potential contractor who has committed an irregularity in the implementation of any other contract financed by the European Communities budget may be excluded from the selection procedure at any time.

An **external audit report** was provided on **September 4, 2006** to the Research Fund for Coal and Steel Programme as requested by article 173(4) of the Commission Regulation³⁹ laying down detailed rules for the implementation of Council Regulation (EC, Euratom) No 1605/2002 on the Financial Regulation applicable to the general budget of the European Communities.

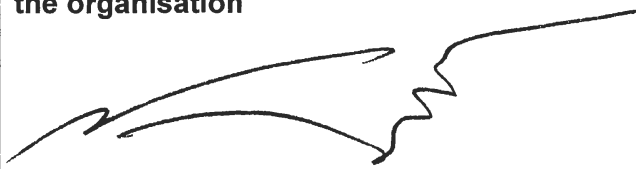
The participant organisation **is aware** that:

- any potential contractor who can not certify that none of the above situations apply, shall be excluded from participation in any future contract;
- any potential contractor having been found guilty of misrepresentation in supplying the information required as a condition for participation in the contract or failing to supply such information shall be excluded from participation in any future contract.

I have, previously or currently submitted this proposal or one similar in content to a Commission Programme in a previous call? **YES**

If **Yes**, please give details of the proposal:

Programme name	RFCS Steel	Year	2005	Proposal No	RFS - PR - 05152
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Name Prof. Dr. NIEMEYER	First name Matthias
Date (DD/MM/YYYY) 04.09.2006	Signature of person(s) authorised to commit the organisation 



Selzgitter Mannesmann Forschung GmbH



EUROPEAN COMMISSION
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OBLIGATORY AT THE SUBMISSION STAGE

Certified Declaration by each participant (including the coordinator)

I **certify** that the information relating to our organisation set out in Forms 1-1 to 6 (and in the legal entity and financial identification forms) of the Submission and/or (*cross as appropriate*) Contract Preparation Forms is accurate and correct, that the estimated costs meet the criteria for eligible costs for Research Fund for Coal and Steel projects, as established by the point 3.6 of the legal basis of the programme (Annex to Council Decision of 1 February 2003 laying down the multiannual guidelines for the research programme of the Research Fund for Coal and Steel) and normal cost accounting principles and that they reflect the estimated costs expected to be incurred in carrying out the work described herein.

I also certify that

<i>Gaz de France – Direction de la Recherche</i>	
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- is committed to participate in the above mentioned project;
- has stable and sufficient sources of funding to maintain its activity throughout its participation in the project and to provide any counterpart funding necessary.
- has or will have the resources as and when needed to carry out its involvement in the above mentioned project.

As required by Article 93 of Council Regulation (EC, Euratom) N° 1605/2002 of 25 June 2002 on the Financial Regulation applicable to the general budget of the European Communities [OJ L248, 16.09.2002, p. 1], I certify that none of the following cases apply to our organisation:

- a) it is bankrupt or being wound up, is having its affairs administered by the courts, has entered into an arrangement with creditors, has suspended business activities, is the subject of proceedings concerning those matters, or is in any analogous situation arising from a similar procedure provided for in national legislation or regulations;
- b) it has been convicted of an offence concerning its professional conduct by a judgement which has the force of *res judicata*;
- c) it has been guilty of grave professional misconduct proven by any means which the contracting authority can justify;
- d) it has not fulfilled obligations relating to the payment of social security contributions or the payment of taxes in accordance with the legal provisions of the country in which it is established or with those of the country of the contracting authority or those of the country where the contract is to be performed;
- e) it has been the subject of a judgement which has the force of *res judicata* for fraud, corruption, involvement in a criminal organisation or any other illegal activity detrimental to the Communities' financial interests;
- f) following another procurement procedure or grant award procedure financed by the Community budget, it has been declared to be in serious breach of contract for failure to comply with its contractual obligations.



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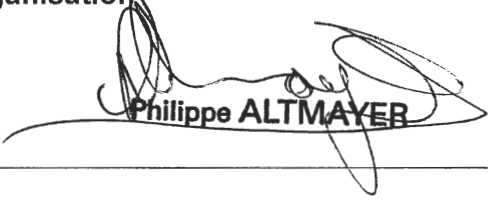
OBLIGATORY AT THE SUBMISSION STAGE

I **understand** that any potential contractor who has committed an irregularity in the implementation of any other contract financed by the European Communities budget may be excluded from the selection procedure at any time.

The participant organisation **is aware** that:

- any potential contractor who can not certify that none of the above situations apply, shall be excluded from participation in any future contract;
- any potential contractor having been found guilty of misrepresentation in supplying the information required as a condition for participation in the contract or failing to supply such information shall be excluded from participation in any future contract.

I have, previously or currently submitted this proposal or one similar in content to a Commission Programme in a previous call? **No**

Name ALTMAYER	First name Philippe
28/08/2006	Signature of person(s) authorised to commit the organisation  Philippe ALTMAYER



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OBLIGATORY AT THE SUBMISSION STAGE

Certified Declaration by each participant (including the coordinator)

I **certify** that the information relating to our organisation set out in Forms 1-1 to 6 (and in the legal entity and financial identification forms) of the Submission and/or (*cross as appropriate*) Contract Preparation Forms is accurate and correct, that the estimated costs meet the criteria for eligible costs for Research Fund for Coal and Steel projects, as established by the point 3.6 of the legal basis of the programme (Annex to Council Decision of 1 February 2003 laying down the multiannual guidelines for the research programme of the Research Fund for Coal and Steel) and normal cost accounting principles and that they reflect the estimated costs expected to be incurred in carrying out the work described herein.

I also certify that

<i>Full official denomination^s</i>	<i>Sika Danmark A/S Praestemosevej 2-4 DK-3480 Fredensborg Denmark Tel: +4548188585 Fax: +4548188496</i>
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- is committed to participate in the above mentioned project;
- has stable and sufficient sources of funding to maintain its activity throughout its participation in the project and to provide any counterpart funding necessary.
- has or will have the resources as and when needed to carry out its involvement in the above mentioned project.

As required by Article 93 of Council Regulation (EC, Euratom) N° 1605/2002 of 25 June 2002 on the Financial Regulation applicable to the general budget of the European Communities [OJ L248, 16.09.2002, p. 1], I certify that none of the following cases apply to our organisation:

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- b) it has been convicted of an offence concerning its professional conduct by a judgement which has the force of res judicata;
- c) it has been guilty of grave professional misconduct proven by any means which the contracting authority can justify;
- d) it has not fulfilled obligations relating to the payment of social security contributions or the payment of taxes in accordance with the legal provisions of the country in which it is established or with those of the country of the contracting authority or those of the country where the contract is to be performed;



- e) it has been the subject of a judgement which has the force of res judicata for fraud, corruption, involvement in a criminal organisation or any other illegal activity detrimental to the Communities' financial interests;
- f) following another procurement procedure or grant award procedure financed by the Community budget, it has been declared to be in serious breach of contract for failure to comply with its contractual obligations.

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OBLIGATORY AT THE SUBMISSION STAGE

I **understand** that any potential contractor who has committed an irregularity in the implementation of any other contract financed by the European Communities budget may be excluded from the selection procedure at any time.

I **enclose** an **external audit report** unless otherwise provided on(please, specify date) to the Research Fund for Coal and Steel Programme as requested by article 173(4) of the Commission Regulation³⁹ laying down detailed rules for the implementation of Council Regulation (EC, Euratom) No 1605/2002 on the Financial Regulation applicable to the general budget of the European Communities.


The participant organisation **is aware** that:

- any potential contractor who can not certify that none of the above situations apply, shall be excluded from participation in any future contract;
- any potential contractor having been found guilty of misrepresentation in supplying the information required as a condition for participation in the contract or failing to supply such information shall be excluded from participation in any future contract.

I have, previously or currently submitted this proposal or one similar in content to a Commission Programme in a previous call? **Yes**

If **Yes**, please give details of the proposal:

Programme name	JoinTec	Year	2005	Proposal No	RFS-PR-05152
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Name Nielsen	First name Henrik
Date (DD/MM/YYYY) 20/07/2006	Signature of person(s) authorised to commit the organisation 



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OBLIGATORY AT THE SUBMISSION STAGE

Certified Declaration by each participant (including the coordinator)

I **certify** that the information relating to our organisation set out in Forms 1-1 to 6 (and in the legal entity and financial identification forms) of the Submission and/or (*cross as appropriate*) Contract Preparation Forms is accurate and correct, that the estimated costs meet the criteria for eligible costs for Research Fund for Coal and Steel projects, as established by the point 3.6 of the legal basis of the programme (Annex to Council Decision of 1 February 2003 laying down the multiannual guidelines for the research programme of the Research Fund for Coal and Steel) and normal cost accounting principles and that they reflect the estimated costs expected to be incurred in carrying out the work described herein.

I also certify that

Full official denomination⁵

Bohlen & Doyen Polska Sp. Z o.o.

Ul. Piastowska 10b / 8

66-300 Miedzyrzecz / Poland

- is committed to participate in the above mentioned project;
- has stable and sufficient sources of funding to maintain its activity throughout its participation in the project and to provide any counterpart funding necessary.
- has or will have the resources as and when needed to carry out its involvement in the above mentioned project.

As required by Article 93 of Council Regulation (EC, Euratom) N° 1605/2002 of 25 June 2002 on the Financial Regulation applicable to the general budget of the European Communities [OJ L248, 16.09.2002, p. 1], I certify that none of the following cases apply to our organisation:

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- c) it has been guilty of grave professional misconduct proven by any means which the contracting authority can justify;
- d) it has not fulfilled obligations relating to the payment of social security contributions or the payment of taxes in accordance with the legal provisions of the country in which it is established or with those of the country of the contracting authority or those of the country where the contract is to be performed;
- e) it has been the subject of a judgement which has the force of res judicata for fraud, corruption, involvement in a criminal organisation or any other illegal activity detrimental to the Communities' financial interests;



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- f) following another procurement procedure or grant award procedure financed by the Community budget, it has been declared to be in serious breach of contract for failure to comply with its contractual obligations.

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OBLIGATORY AT THE SUBMISSION STAGE

I **understand** that any potential contractor who has committed an irregularity in the implementation of any other contract financed by the European Communities budget may be excluded from the selection procedure at any time.

I **enclose an external audit report** unless otherwise provided on(please, specify date) to the Research Fund for Coal and Steel Programme as requested by article 173(4) of the Commission Regulation³⁹ laying down detailed rules for the implementation of Council Regulation (EC, Euratom) No 1605/2002 on the Financial Regulation applicable to the general budget of the European Communities.

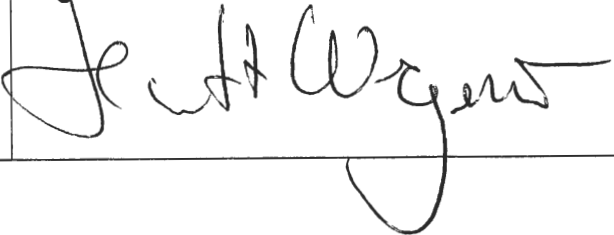
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- any potential contractor having been found guilty of misrepresentation in supplying the information required as a condition for participation in the contract or failing to supply such information shall be excluded from participation in any future contract.

I have, previously or currently submitted this proposal or one similar in content to a Commission Programme in a previous call? **Yes**

If **Yes**, please give details of the proposal:

Programme name	JoinTec	Year	2005	Proposal No	RFS-PR-05152
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Name Wegener	First name Hartmut
Date (DD/MM/YYYY) 06.09.2006	Signature of person(s) authorised to commit the organisation 



EUROPEAN COMMISSION
RESEARCH DIRECTORATE-GENERAL

Research Programme of the Research Fund for Coal and Steel

Certified Declaration by each participant (including the coordinator)

I **certify** that the information relating to our organisation set out in Forms 1-1 to 6 (and in the legal entity and financial identification forms) of the Submission and/or (*cross as appropriate*) Contract Preparation Forms is accurate and correct, that the estimated costs meet the criteria for eligible costs for Research Fund for Coal and Steel projects, as established by the point 3.6 of the legal basis of the programme (Annex to Council Decision of 1 February 2003 laying down the multiannual guidelines for the research programme of the Research Fund for Coal and Steel) and normal cost accounting principles and that they reflect the estimated costs expected to be incurred in carrying out the work described herein.

I also certify that

Full official denomination **Centro Sviluppo Materiali**

- is committed to participate in the above mentioned project;
- has stable and sufficient sources of funding to maintain its activity throughout its participation in the project and to provide any counterpart funding necessary.
- has or will have the resources as and when needed to carry out its involvement in the above mentioned project.

As required by Article 93 of Council Regulation (EC, Euratom) N° 1605/2002 of 25 June 2002 on the Financial Regulation applicable to the general budget of the European Communities [OJ L248, 16.09.2002, p. 1], I certify that none of the following cases apply to our organisation:

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- d) it has not fulfilled obligations relating to the payment of social security contributions or the payment of taxes in accordance with the legal provisions of the country in which it is established or with those of the country of the contracting authority or those of the country where the contract is to be performed;
- e) it has been the subject of a judgement which has the force of res judicata for fraud, corruption, involvement in a criminal organisation or any other illegal activity detrimental to the Communities' financial interests;
- f) following another procurement procedure or grant award procedure financed by the Community budget, it has been declared to be in serious breach of contract for failure to comply with its contractual obligations.



EUROPEAN COMMISSION
RESEARCH DIRECTORATE-GENERAL

Research Programme of the Research Fund for Coal and Steel

I **understand** that any potential contractor who has committed an irregularity in the implementation of any other contract financed by the European Communities budget may be excluded from the selection procedure at any time.

I **enclose an external audit report** unless otherwise provided on(please, specify date) to the Research Fund for Coal and Steel Programme as requested by article 173(4) of the Commission Regulation³⁹ laying down detailed rules for the implementation of Council Regulation (EC, Euratom) No 1605/2002 on the Financial Regulation applicable to the general budget of the European Communities.

The participant organisation is **aware** that:

- any potential contractor who can not certify that none of the above situations apply, shall be excluded from participation in any future contract;
- any potential contractor having been found guilty of misrepresentation in supplying the information required as a condition for participation in the contract or failing to supply such information shall be excluded from participation in any future contract.

I have, previously or currently submitted this proposal or one similar in content to a Commission Programme in a previous call? **Yes/No**

If **Yes**, please give details of the proposal:

Programme name	<i>RFCs Steel</i>	Year	<i>2005</i>	Proposal No	<i>RFS-PR-05152</i>
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Name <i>BRUNO</i>	First name <i>Roberto</i>
Date (DD/MM/YYYY) <i>23.08.2006</i>	Signature of person(s) authorised to commit the organisation <i>[Handwritten Signature]</i> CENTRO SVILUPPO MATERIALI S.p.A. CHIEF EXECUTIVE OFFICER DR. ROBERTO BRUNO



EUROPEAN COMMISSION
RESEARCH DIRECTORATE-GENERAL

Directorate G - Industrial technologies
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OBLIGATORY AT THE SUBMISSION STAGE

Certified Declaration by each participant (including the coordinator)

I **certify** that the information relating to our organisation set out in Forms 1-1 to 6 (and in the legal entity and financial identification forms) of the Submission and/or (*cross as appropriate*) Contract Preparation Forms is accurate and correct, that the estimated costs meet the criteria for eligible costs for Research Fund for Coal and Steel projects, as established by the point 3.6 of the legal basis of the programme (Annex to Council Decision of 1 February 2003 laying down the multiannual guidelines for the research programme of the Research Fund for Coal and Steel) and normal cost accounting principles and that they reflect the estimated costs expected to be incurred in carrying out the work described herein.

I also certify that

Full official denomination³	Mannesmann Fuchs Rohr GmbH
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- is committed to participate in the above mentioned project;
- has stable and sufficient sources of funding to maintain its activity throughout its participation in the project and to provide any counterpart funding necessary.
- has or will have the resources as and when needed to carry out its involvement in the above mentioned project.

As required by Article 93 of Council Regulation (EC, Euratom) N° 1605/2002 of 25 June 2002 on the Financial Regulation applicable to the general budget of the European Communities [OJ L248, 16.09.2002, p. 1], I certify that none of the following cases apply to our organisation:

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- d) it has not fulfilled obligations relating to the payment of social security contributions or the payment of taxes in accordance with the legal provisions of the country in which it is established or with those of the country of the contracting authority or those of the country where the contract is to be performed;
- e) it has been the subject of a judgement which has the force of res judicata for fraud, corruption, involvement in a criminal organisation or any other illegal activity detrimental to the Communities' financial interests;
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I have, previously or currently submitted this proposal or one similar in content to a Commission Programme in a previous call? **Yes/No**

If **Yes**, please give details of the proposal:

Programme name	-	Year	-	Proposal No	-
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Name Winkels	First name Jörn
Date (DD/MM/YYYY) <i>11.08.2006</i>	Signature of person(s) authorised to commit the organisation <i>[Signature]</i>



EUROPEAN COMMISSION
RESEARCH DIRECTORATE-GENERAL

Directorate G - Industrial technologies
Research Fund for Coal and Steel

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Form 7

OBLIGATORY AT THE SUBMISSION STAGE

Certified Declaration by each participant (including the coordinator)

I **certify** that the information relating to our organisation set out in Forms 1-1 to 6 (and in the legal entity and financial identification forms) of the Submission and/or (*cross as appropriate*) Contract Preparation Forms is accurate and correct, that the estimated costs meet the criteria for eligible costs for Research Fund for Coal and Steel projects, as established by the point 3.6 of the legal basis of the programme (Annex to Council Decision of 1 February 2003 laying down the multiannual guidelines for the research programme of the Research Fund for Coal and Steel) and normal cost accounting principles and that they reflect the estimated costs expected to be incurred in carrying out the work described herein.

I also certify that

<i>Full official denomination</i> ⁵	<i>Arbeitsgemeinschaft für Wärme und Heizkraftwirtschaft – AGFW – e. V. bei dem VDEW</i>
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- is committed to participate in the above mentioned project;
- has stable and sufficient sources of funding to maintain its activity throughout its participation in the project and to provide any counterpart funding necessary.
- has or will have the resources as and when needed to carry out its involvement in the above mentioned project.

As required by Article 93 of Council Regulation (EC, Euratom) N° 1605/2002 of 25 June 2002 on the Financial Regulation applicable to the general budget of the European Communities [OJ L248, 16.09.2002, p. 1], I certify that none of the following cases apply to our organisation:

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OBLIGATORY AT THE SUBMISSION STAGE

I **understand** that any potential contractor who has committed an irregularity in the implementation of any other contract financed by the European Communities budget may be excluded from the selection procedure at any time.

I **enclose** an **external audit report** unless otherwise provided on(please, specify date) to the Research Fund for Coal and Steel Programme as requested by article 173(4) of the Commission Regulation³⁹ laying down detailed rules for the implementation of Council Regulation (EC, Euratom) No 1605/2002 on the Financial Regulation applicable to the general budget of the European Communities.


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I have, previously or currently submitted this proposal or one similar in content to a Commission Programme in a previous call? **Yes**

If **Yes**, please give details of the proposal:

Programme name	JoinTec	Year	2005	Proposal No	RFS-PR-05152
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Name Lutsch	First name Werner
Date (DD/MM/YYYY) 1.8.2006	Signature of person(s) authorised to commit the organisation  ARBEITSGEMEINSCHAFT FÜR WÄRME UND HEIZKRAFTWIRTSCHAFT-AGFW - e.V. BEI DEM VDEW e.V. Stresemannallee 28 60596 Frankfurt am Main