



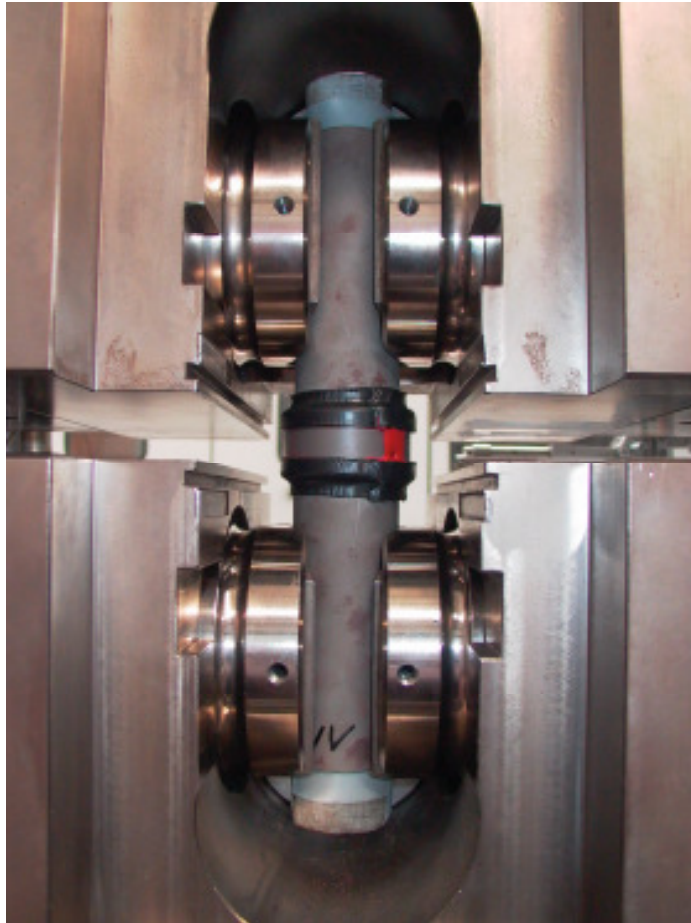
Project “Jointec“

Small Scale Tensile Tests

on pipes Ø 50 x 3

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SMLP Hamm, June 25th, 2008

Testing Conditions

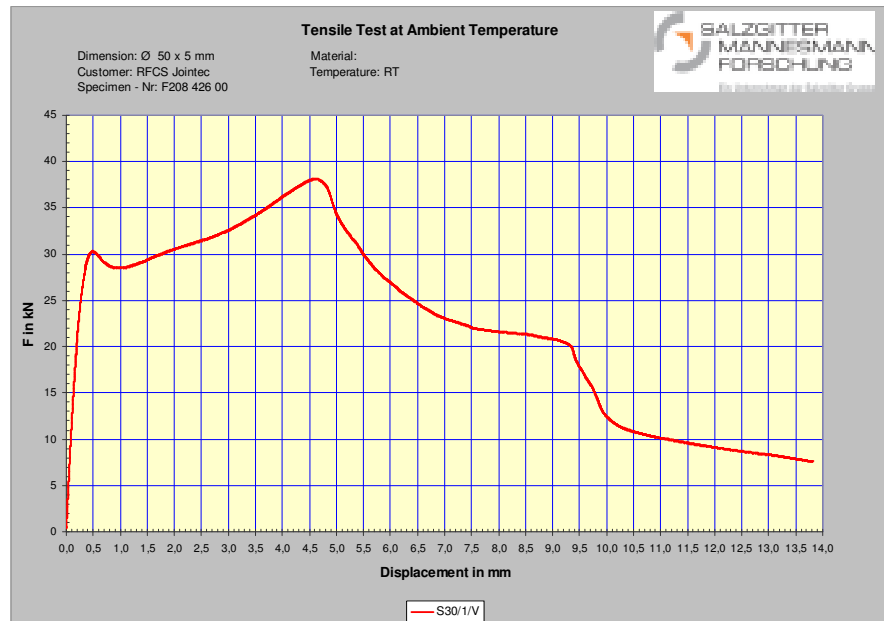


- Zwick Z600
- Load rate: $v = 1.08 \text{ mm/min}$
- 3 Specimen:
 - Pipe: 50x3, Sleeve: 60x3 mm (S235, S355)
 - Thickness adhesive layer: 2 mm
 - Adhesive: PU156
 - Length of sleeve: 30 mm
 - Injection in- and outlet

Specimen	Injection
S30/1/V	180°
S30/2/V	180°
S30/1/G	0°

Small Scale Tensile Tests

Specimen S30/1/V



max. tensile force:

$$F_{\max} = 38 \text{ kN}$$

max. stress in adhesive layer:

$$\tau_{\text{lay}} = 16.1 \text{ MPa}$$

max. stress in steel pipe:

$$\sigma_p = 86 \text{ MPa}$$

First yield:

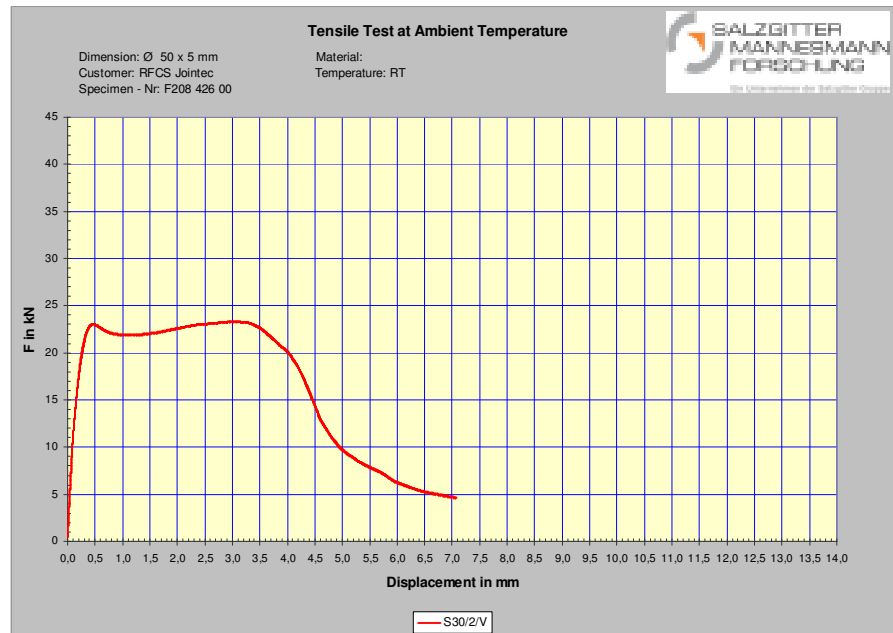
$$F_y = 30 \text{ kN}$$

Good distribution of adhesive in sleeve



Small Scale Tensile Tests

Specimen S30/2/V



max. tensile force:

$$F_{\max} = 23 \text{ kN}$$

max. stress in adhesive layer

$$\tau_{\text{lay}} = 9.8 \text{ MPa}$$

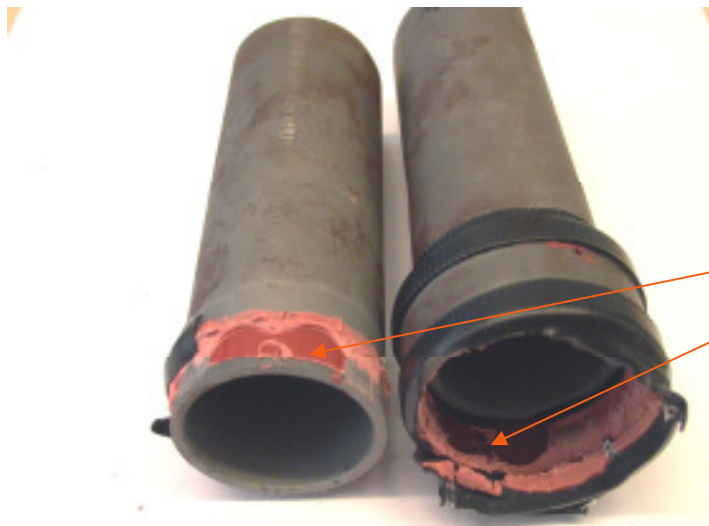
max. stress in steel pipe:

$$\sigma_p = 52 \text{ MPa}$$

First yield:

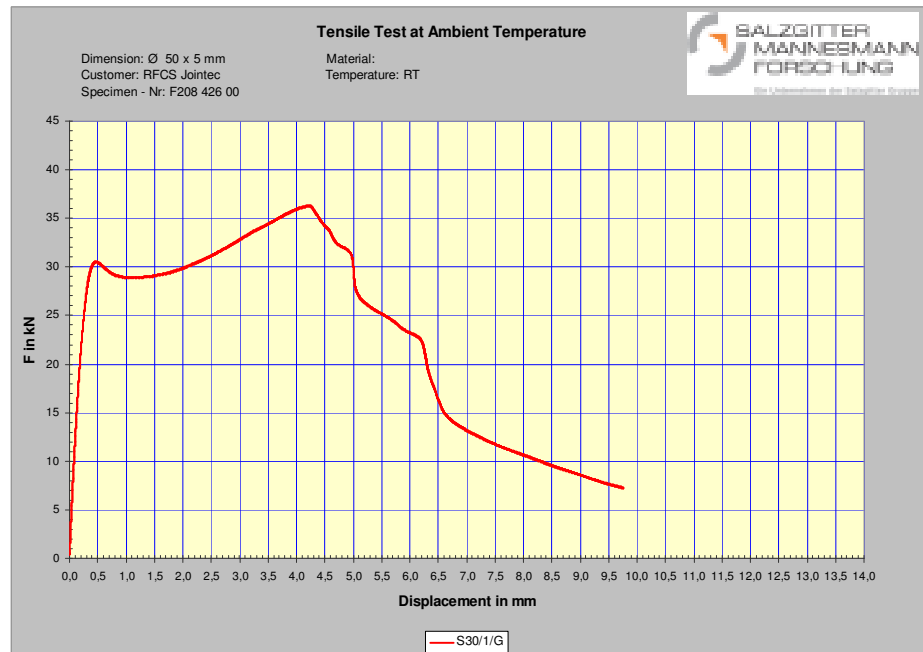
$$F_y = 23 \text{ kN}$$

Large cavities in adhesive within sleeve



Small Scale Tensile Tests

Specimen S30/1/G



max. tensile force:

$$F_{\max} = 36 \text{ kN}$$

max. stress in adhesive layer

$$\sigma_{\text{lay}} = 15.3 \text{ MPa}$$

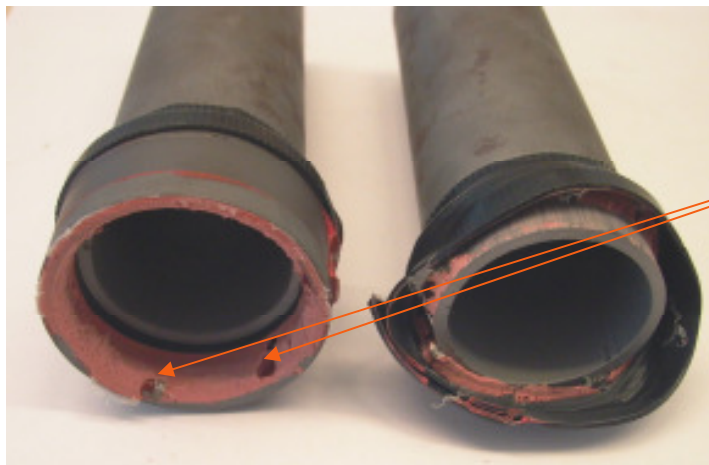
max. stress in steel pipe:

$$\sigma_p = 81 \text{ MPa}$$

First yield:

$$F_y = 31 \text{ kN}$$

3 small cavities in adhesive within sleeve



Specimen	Injection	F_{\max} [kN]	τ_{lay} [MPa]	σ_p [MPa]
S30/1/V	180°	38	16,1	86
S30/2/V	180°	23	9,8	52
S30/1/G	0°	36	15,3	81

- No influence of in-and outlet position (0°, 180°) derivable
- Large cavities in adhesive lead to lower max. tensile force



- Determine causes for cavities/ detect and avoid cavities
- More tests required to identify best in- and outlet position
- Small Scale bending and torsion test planned