Motivation, Objective

➢ In oil conveyor plants steel is to be replaced as material for the pump rods by fiber-reinforced polymers. Adhesive joints are intended for connecting the pump rods with the remaining structural steelwork.

➢ Quality of different sticking procedures and suitability of design for the adhesive surface should be evaluated by non-destructive methods.

➢ Investigations with ultrasound and X-rays were not successful.

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Data Acquisition

Settings of AE system AE.engine

Frequency range  100 … 300 kHz  
AE channels       4               
Sample rate       2 MHz            
Sample length     64 kSamples     
Dynamic           90 dB_{AE}       
Waveform buffer   256 MSamples    

AE system with pump rod prepared like tensile specimen and four sensors

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Evaluation Methods

- Maximum amplitude
- Event rate
- Energy per event
- Felicity factor
- 2D location plus gate technique

Typical waveforms for events at the beginning of the damage

Tensile specimen with four sensors

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Results

Linear location was used
• to exclude event generated in the tensile testing machine and
• to distinguish events from both upper and lower adhesive joint.

Increasing commutative events of three following each other load cycles was defined as criterion for the begin of the damage.

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Summary

- In the stage of development the acoustic emission analysis has been proven as fast procedure to evaluate the quality of different sticking procedures and of different constructions for the adhesive surfaces.

- During cyclic loading the adhesive joint showed a clear felicity effect for all tested designs at beginning of damage.