TÜV Rheinland Material Testing

- Failure Analysis
- Replica Technique

Dr.-Ing. Jürgen Dartmann

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Briefly about me, Dr.-Ing. Jürgen Dartmann

Expert for damage analysis, corrosion and destructive material testing; Senior Manager TÜV Rheinland Material Testing,

More than 20 years of experience

- Damage analysis in different technical sectors (power plants, chemical industry, construction etc.) esp. on metals and welds
- Material testing within damage analysis (metals and welds), like destructive testing, metallography and SEM/EDS
- On-site inspections and production control,
- Training of TÜV experts concerning materials, corrosion and corrosion protection, damage analysis, feed water quality
- Material quality control (destructive material testing)
- Official inspector (Notified Body) for material testing and material qualification
- Expert in legal proceedings, as well as consultant for insurance companies and law firms, in technical disputes
- Leadership and management
  (currently responsible for 45 employees, P&L responsibility)
- Certified mediator

Failure Analysis in a coal fired power plant

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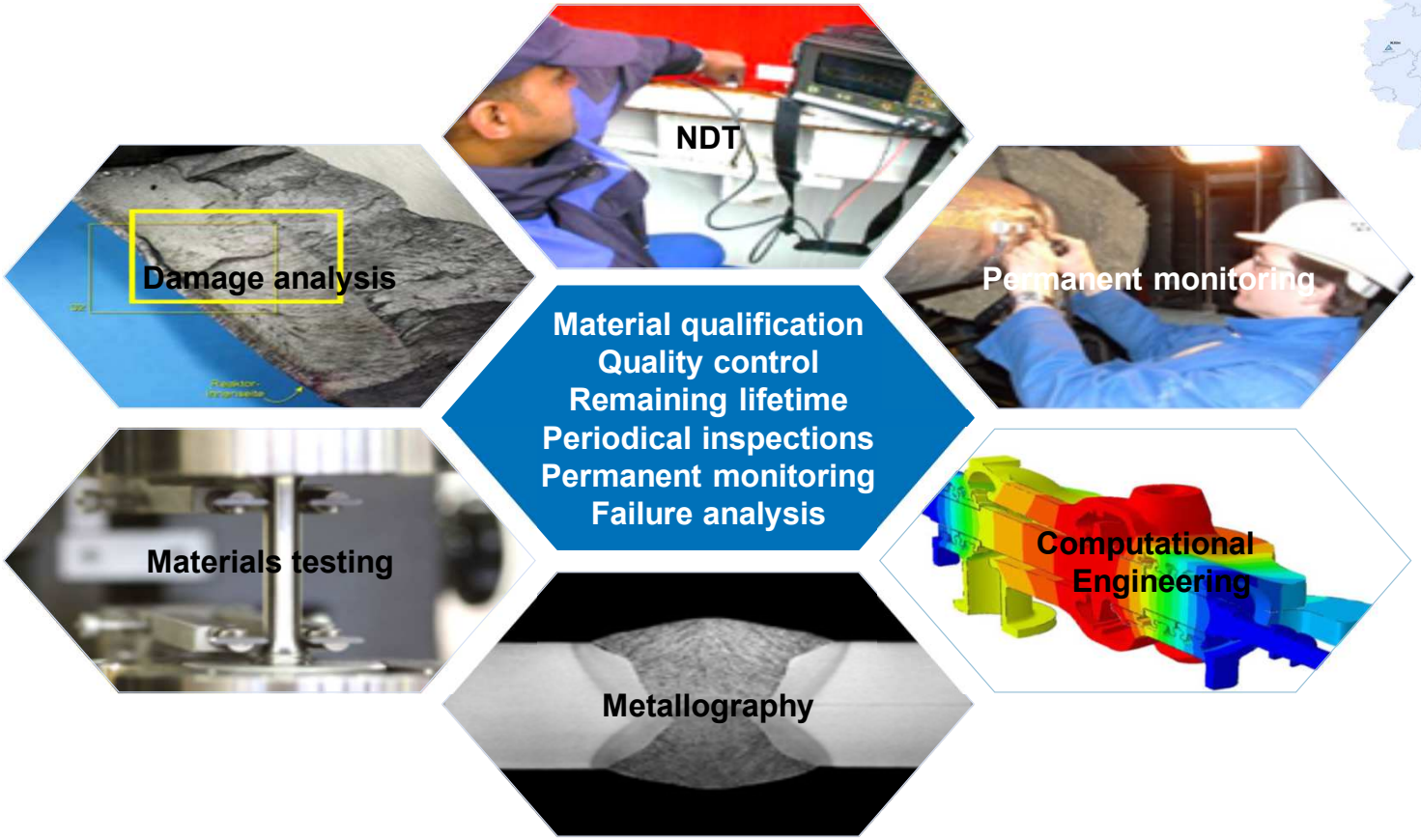
TÜV Rheinland Material Testing, Lab and Field Services



Main Customers

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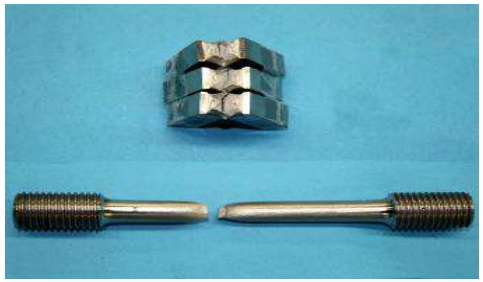
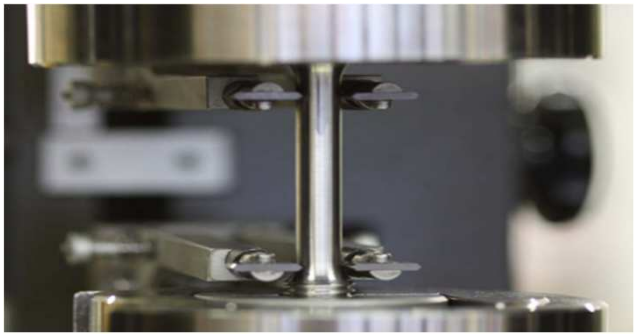
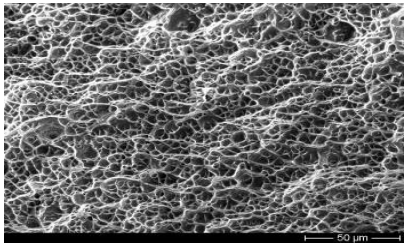
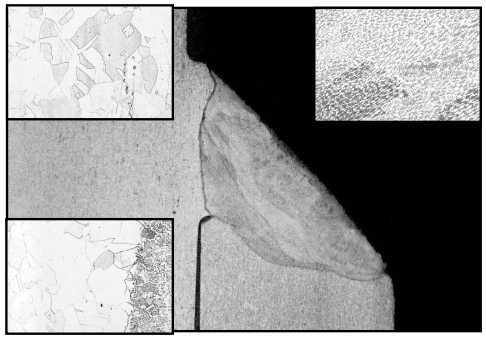
Sample Preparation, Testing, Metallography and Scanning Electron Microscope









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Laboratory and Field Services - Failure Analysis

Determine the damage

→

Assess damaged item

→ On site inspection

Determine the inspection methods

NDT ⋯→ Destructive tests

→ VT, PT (surface)
→ MT, ET (~ surface)
→ UT, RT (Volumn)
→ AT, LT (Special test.)
→ Measuring method

→ Material analysis
→ REM-inspections
→ Metallografic inspec.
→ mech./ technolog. test.

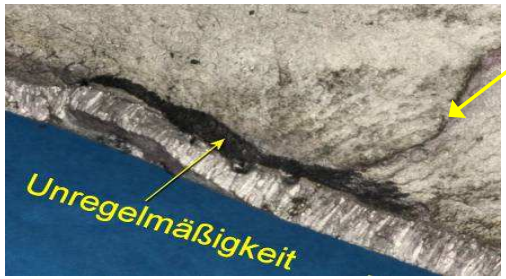
Damage type and cause

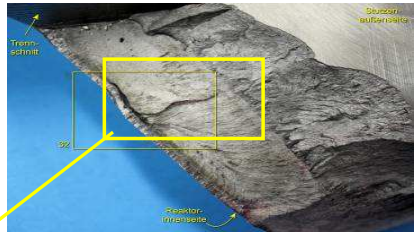
→

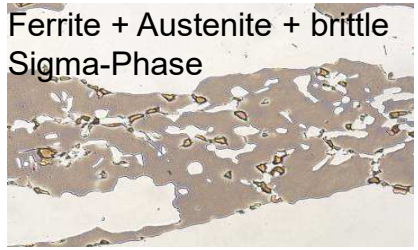
Damage corrective measures and recommendations

→

→







✓Brittle forced fracture

✓Failures during heat treatment

✓Check heat treatments parameters

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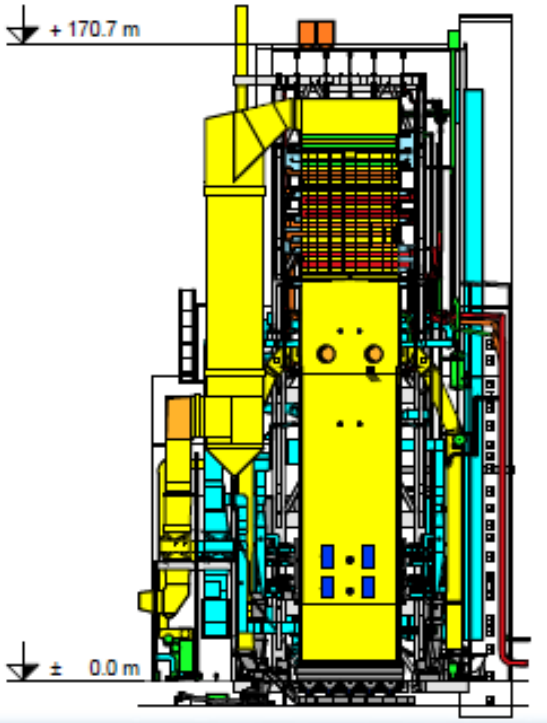
Failure Analysis on a super heater pipe, coal fired power plant



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Usual Failure Analysis

What we do

- locally, regionally and globally -

New Failure Analysis

Analysis of technical failures On-Site and Lab

Major/Fatal/Catastrophic Failure Investigation + Major Failure Management

- **Party expert in technical disputes**
  court and arbitration proceedings
- **Umbrella expertise**
  combining / evaluating / managing different technical experts
- **Bridge builder / moderator**
  between lawyers, businessmen and engineers
- **Major Failure Investigation**
  already in practice

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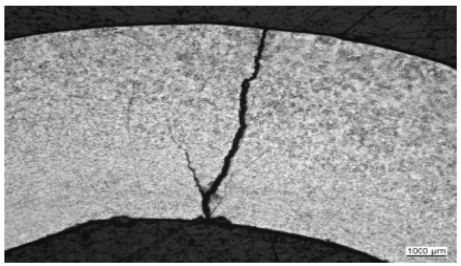
References (Major) Failure Analysis on coal fired power plants

- 800 + 1080 MW: Trouble shooting of material problems with membrane walls during installation and first operation
- 800 MW: Damages on weldings of evaporator and superheater tubes after chemical contamination more than 1,200 leakages and cracks (1 Billion €)
- 800 MW: Leakages and cracks on new developed boiler steel for heating surfaces (200 Million €)
- 2 x 1080 MW: Leakages and cracks on welded membrane wall tubes of new builded power plants (400 Million €)



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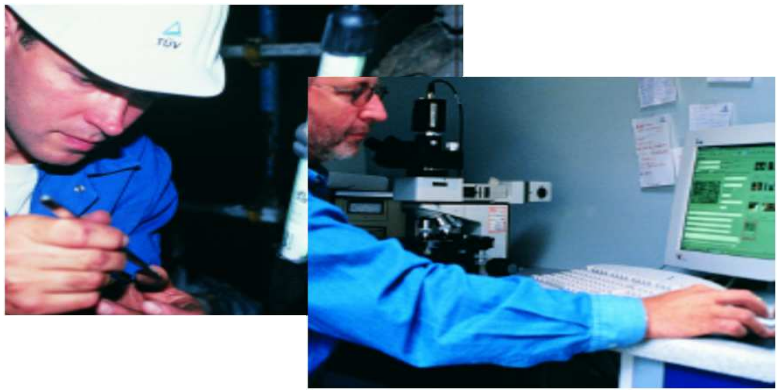
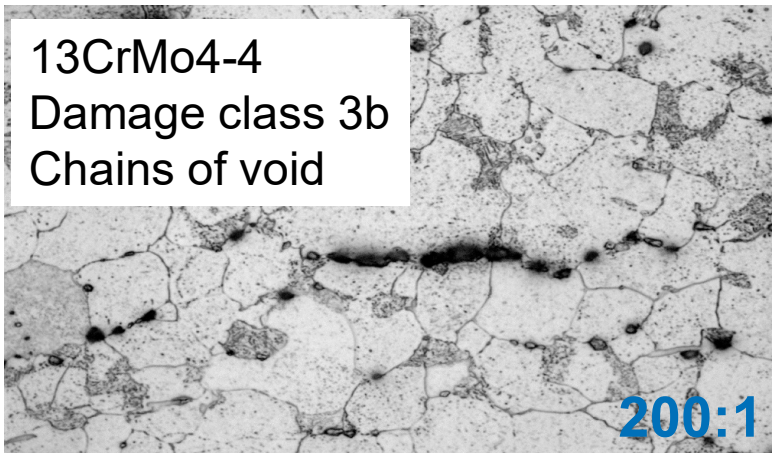
Field Services - Replica > Microstructure assessment on site

- ✓ Non-destructive Microstructure evaluation of components on site with “**Replicas**”
- ✓ Main application:
  Creep damage on boilers, turbines , bends headers etc.
- ✓ Prompt assessment, **high resolution**, favourable price and fast
- ✓ Shows the microstructures **current status** of the component
- ✓ Evaluation according to VGB-S-517
- ✓ Basis for determination of **remaining lifetime estimation**





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Reference: Replica on Steam System, esp. superheater tubes + collectors

Client	Power plant operator, 800 MW, coal fired
Location	Germany
Timeframe	March - April 2023, 25 Days
Main Services	approx. 400 Replica

Project description

- Planning and defining the scope of inspection, together with the operator and the inspection body
- Replica preparation onsite using two shifts
- Reducing shutdown time
- Evaluation and remaining lifetime calculation according to VGB-S-517
- Recommendations of measures for continued operation

TÜV Rheinland - Working Together Worldwide

Experience Exchange between
TÜV Rheinland Germany and TÜV Rheinland India

Failure Analysis can be done bei TR India experts, also in cooperation with TR Germany experts

Replica can be prepared onsite bei TR India, evaluation and remaining lifetime calculations can be done in cooperation with TR Germany

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Contact

Dr.-Ing. Jürgen Dartmann

TÜV Rheinland Werkstoffprüfung
Am Grauen Stein
51105 Cologne
Germany

Phone: 0049 221 806 2404
Mobil: 0049 172 2876795

Email: Juergen.Dartmann@de.tuv.com

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