

Pneumatic Impact Treatment



PIT - a *new generation* of POST WELD TREATMENT methods with the aim to improve dynamic loaded structures

The „Anti Aging Procedure“ for your welded structures



PIT is the perfect completion to your welding process!

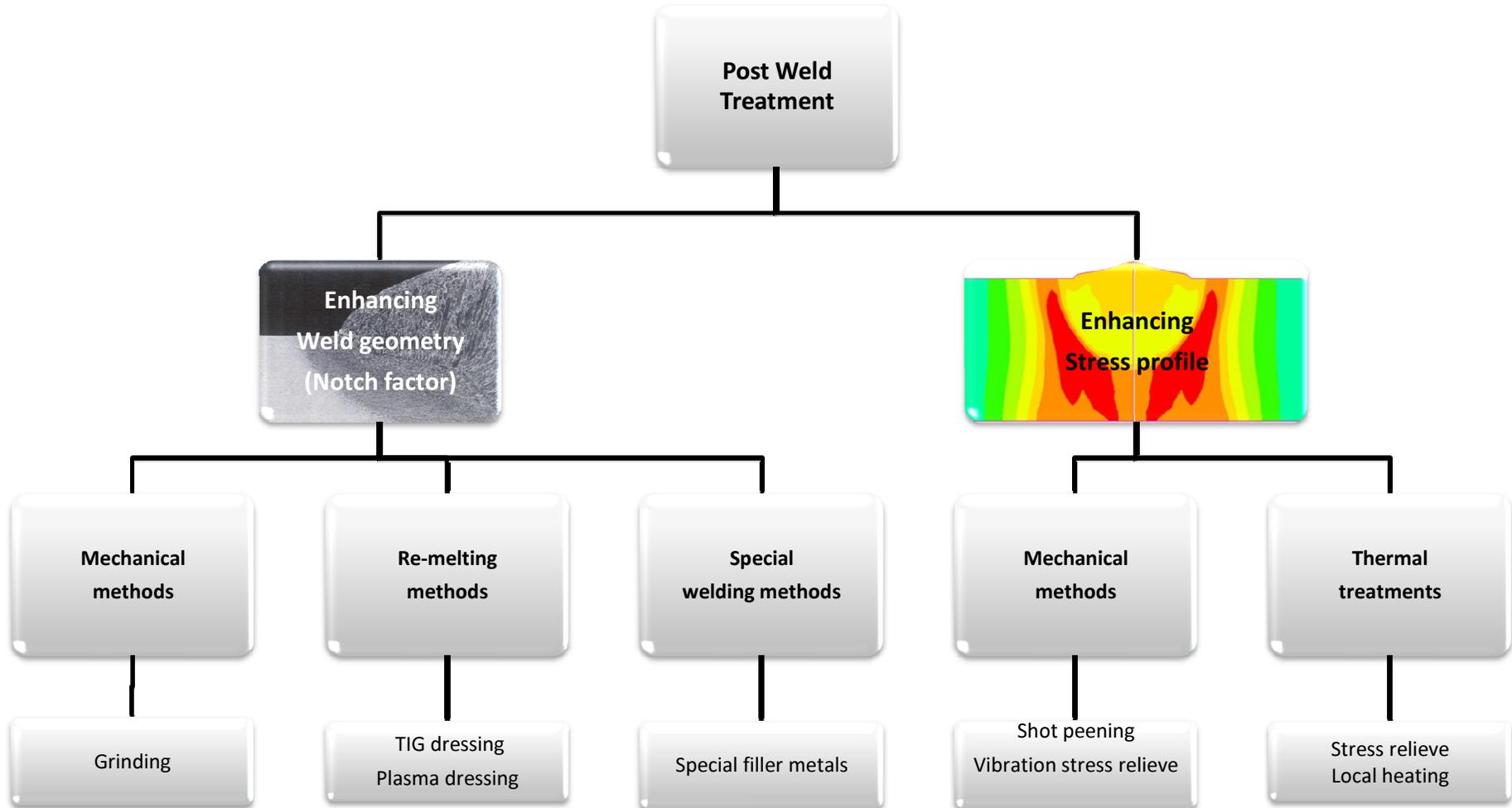
The combination of optimal welding process together with „Pneumatic Impact Treatment“ improves the dynamic load capacity of your structures significantly.

Together with modern design this can result in a high potential of material cost saving.



Preventive usage at existing structures will also increase the availability of your structure / products considerably.

PIT combines known methods of post weld treatment



... combines both way's of conventional methods in just one step

- The improvement of the weld geometry (notch factor)
- Introduction of inherent compressive stresses in the materials surface

...only this combination, as well as the additional surface hardening, leads to the excellent technical and economical results!



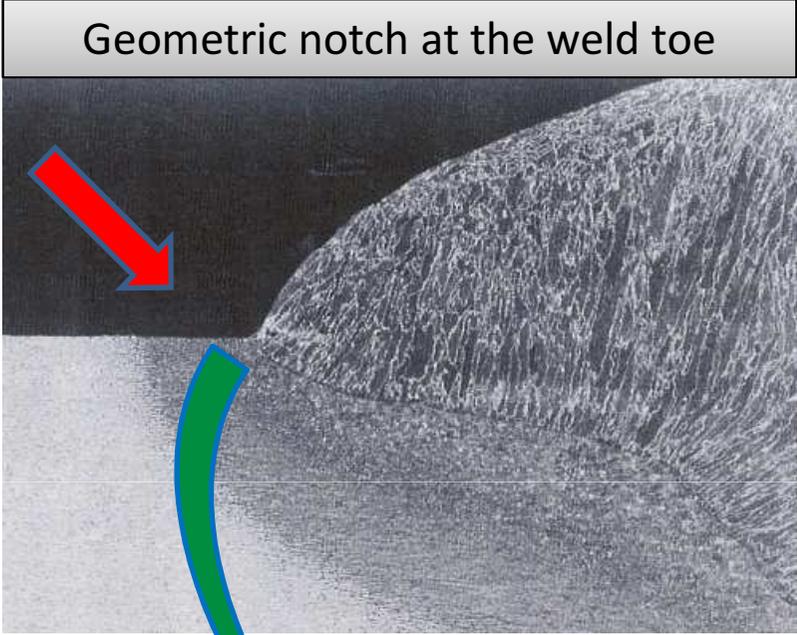
- *Multiplication of fatigue life*
- *Dublication of the fatigue strength*



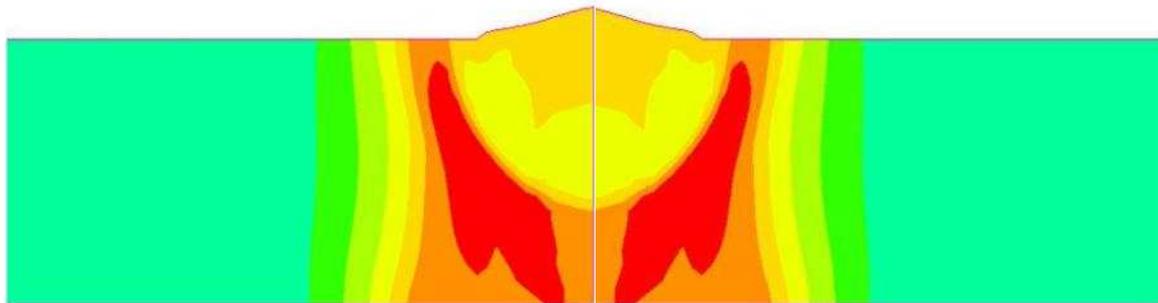
Universität Stuttgart
Germany



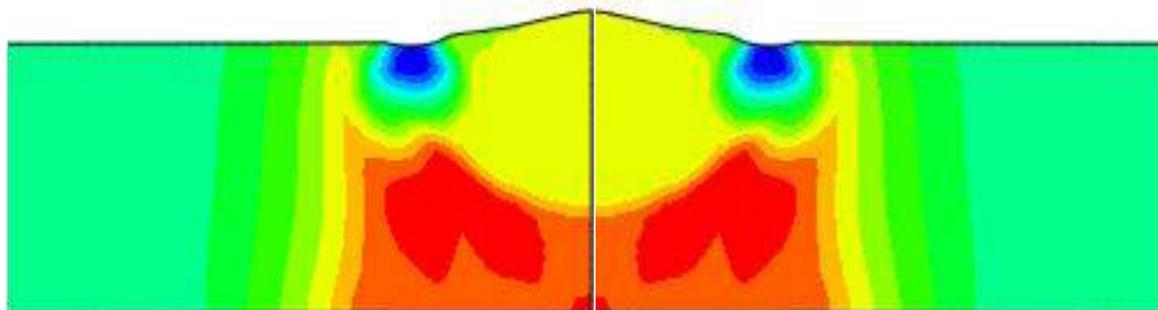
Improvement of the weld geometry



Weld connection with residual tensile stresses after welding



Weld connection with by PIT introduced compressive stresses



CONTOURS

Sigma 33

Time 3220

Comput.Ref Global

Min = -170.45

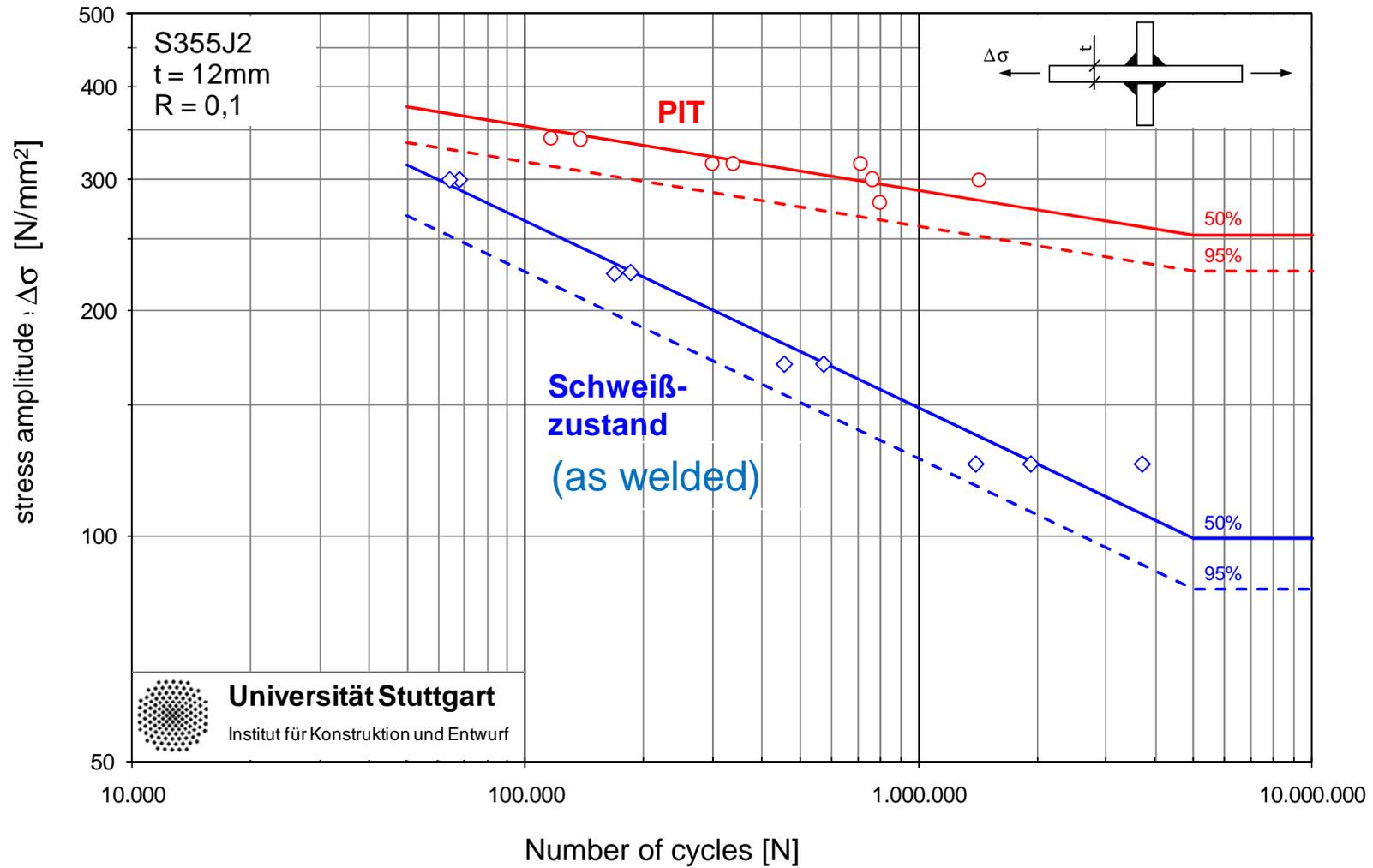
Max = 1005.5



- **Significant enhancement of the fatigue life**
- **Almost duplication of the fatigue strength**
- **Possibility to save material (weight) up to 40%**
- **Enhancing the equipments or structures availability**
- **Reliability improvement**
- **Reduction of distortion caused by welding**
- **Increasing surface hardness**
- **Prevention of stress corrosion cracking**



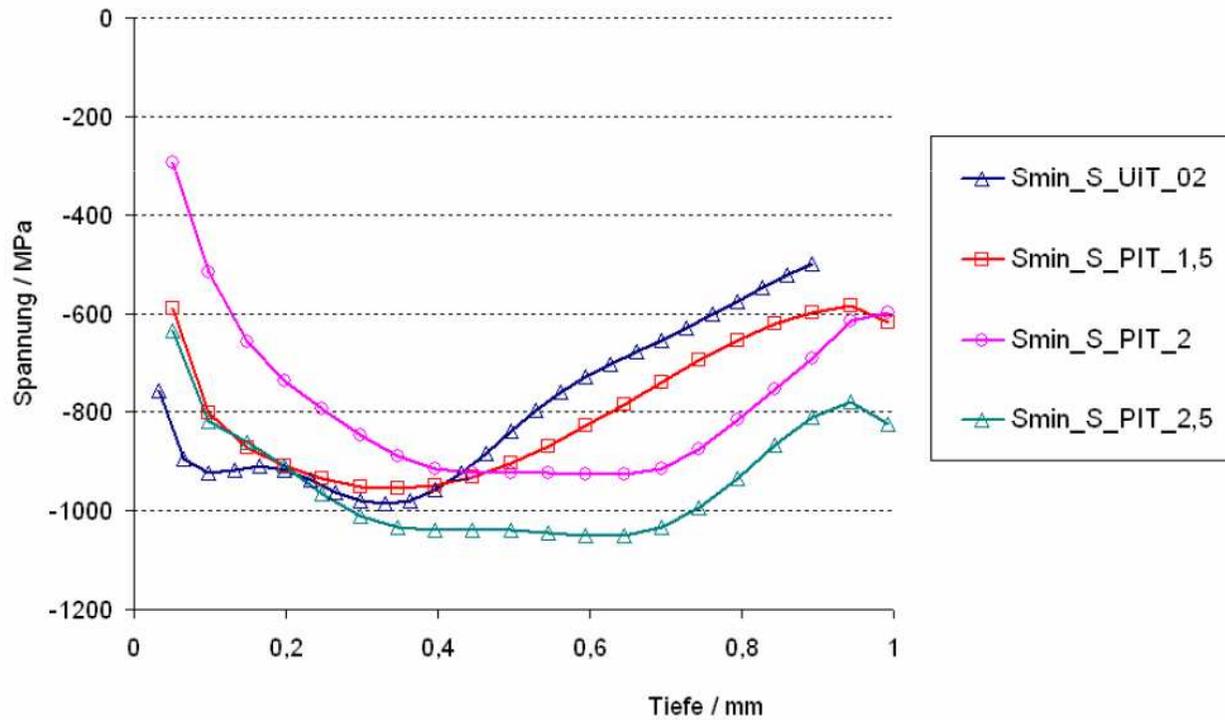
cross joint S355 R = 0,1





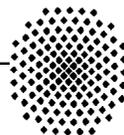
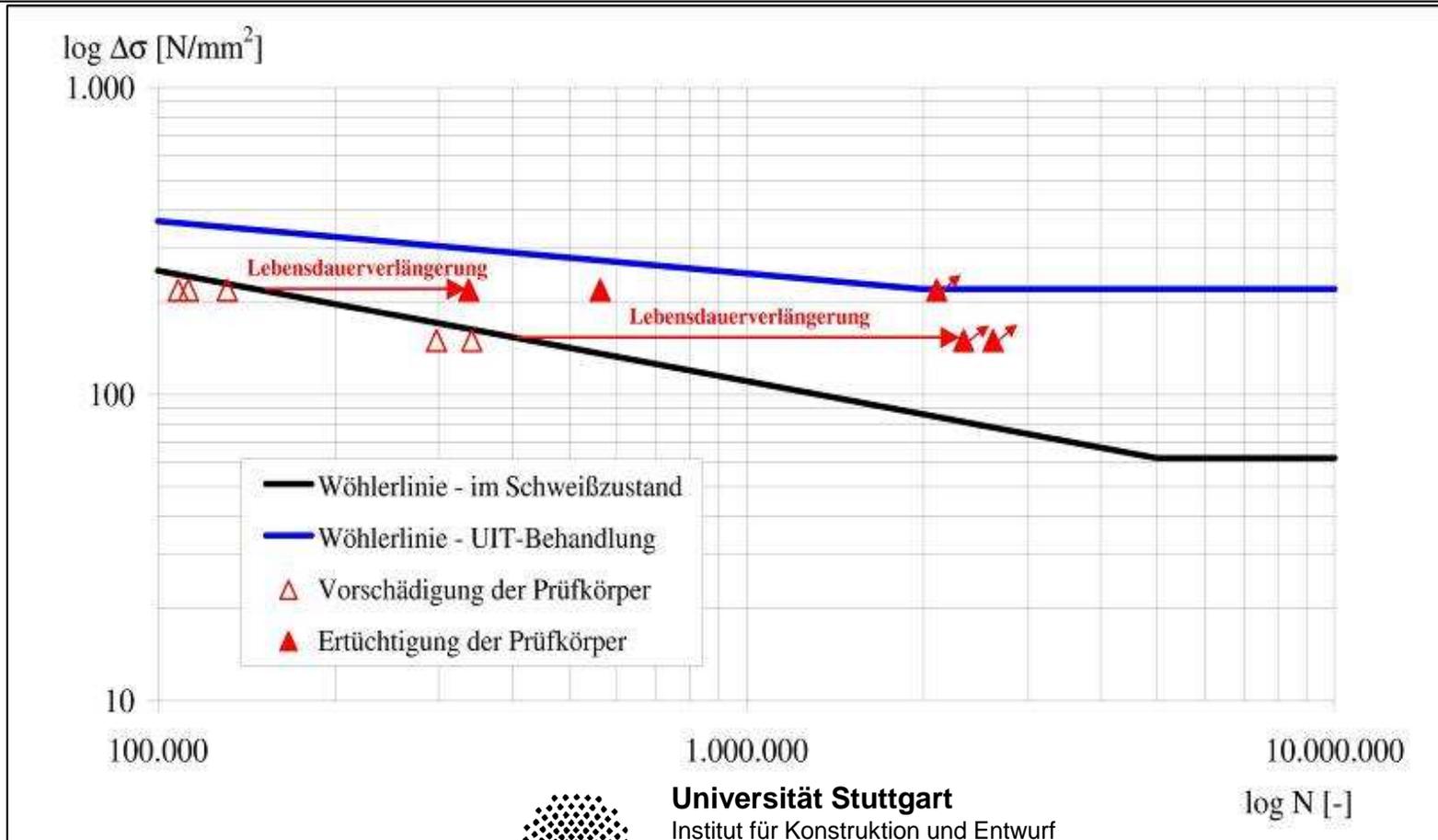
JOIN

Comparising compressive stresses in sand blasted plates S 700 MC after UIT or PIT Treatment



...also for treatment of pre-damaged (existing) structures

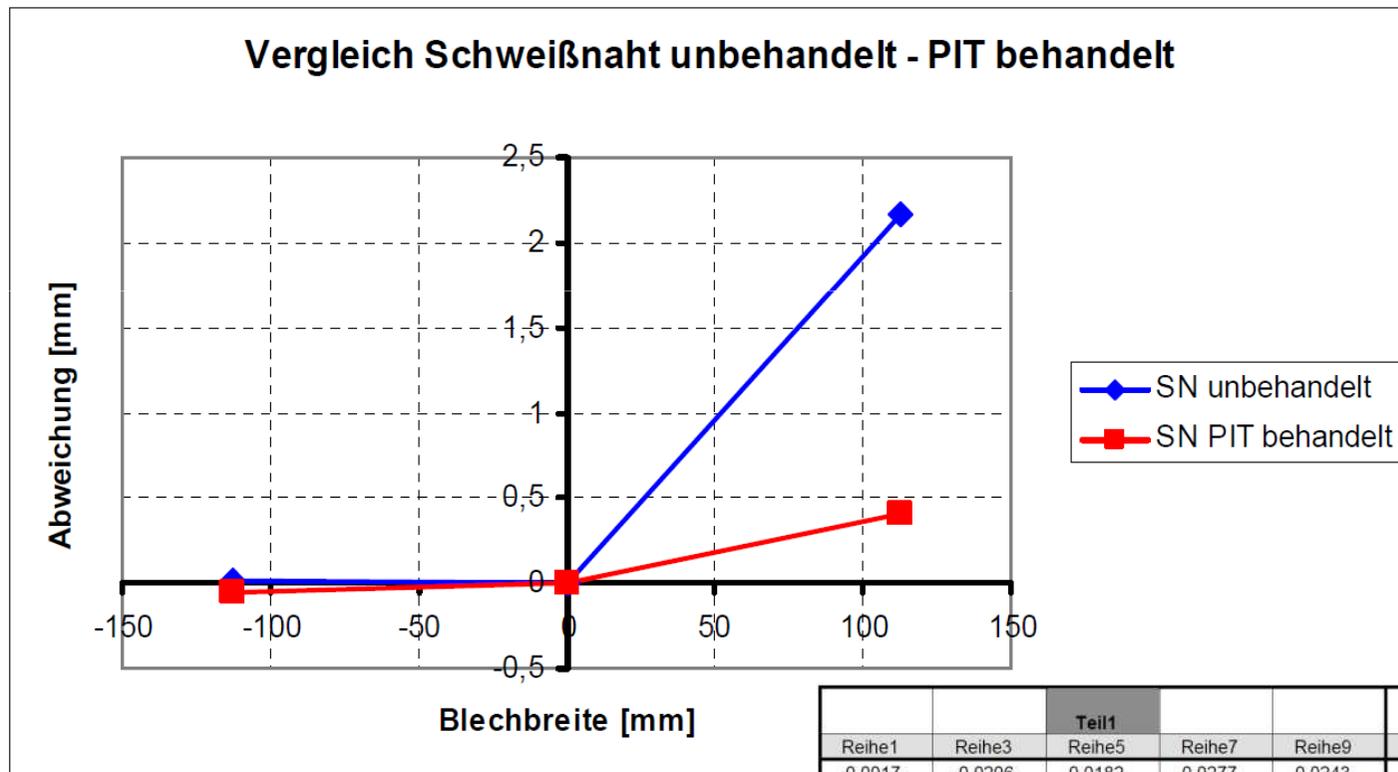
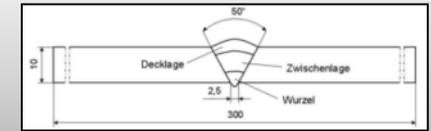
Untreated samples have been dynamically loaded till 90 % of their calculated fatigue life and are treated afterwards. The results show almost identical values compared with samples treated without pre-damaging.



Reducing distortion caused by welding



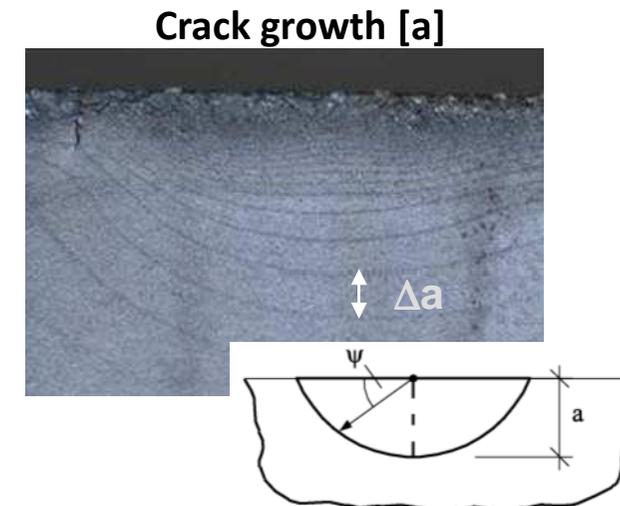
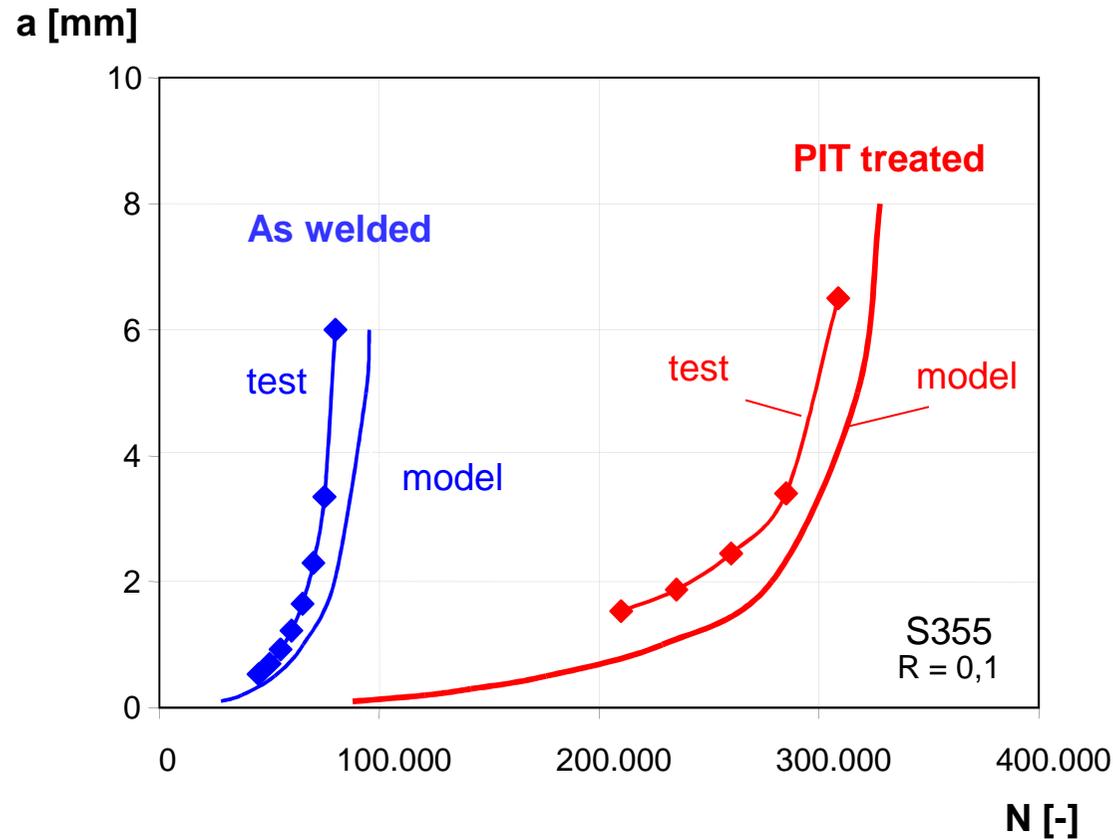
- Steel plate S235JR 300mm x150mm x10mm
- stress-relieved before welding (by heat treatment) in order to prevent falsifications
- Untreated compared with each weld layer PIT treated



					Mittelwert \bar{x}	
Reihe1	Reihe3	Teil1 Reihe5	Reihe7	Reihe9	X	Y
-0,0017	-0,0206	0,0182	0,0277	0,0243	-112,5	0,00958
2,1647	2,2274	2,2834	2,1376	1,9816	112,5	2,15894
Reihe2	Reihe4	Teil2 Reihe6	Reihe8	Reihe10		
-0,0099	-0,5779	0,1410	0,1033	0,0619	-112,5	-0,05632
0,1027	-0,0666	0,3808	0,7041	0,9250	0	0
					112,5	0,40920

Estimation of fatigue life by way of calculations

A calculation model developed by the University of Stuttgart shows similar values compared to the values gained from test specimens.



Test results can be numerically calculated

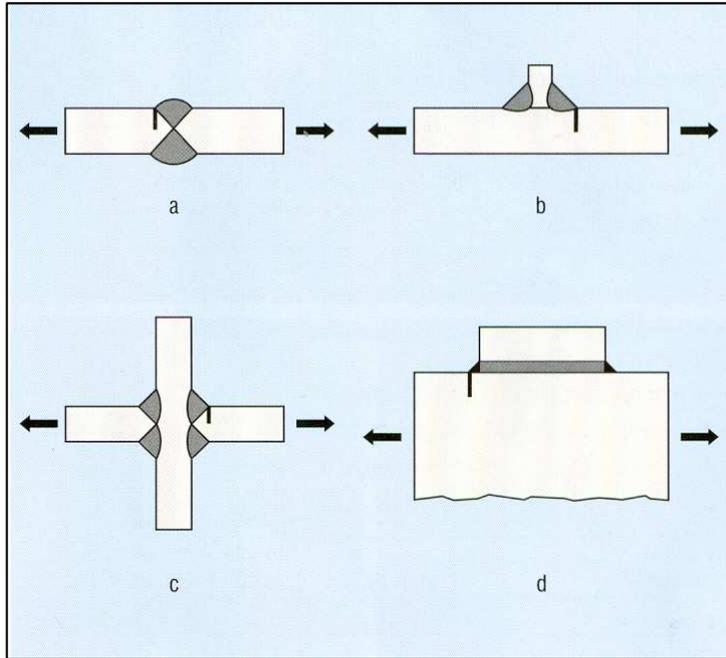
Theoretical material saving possibilities



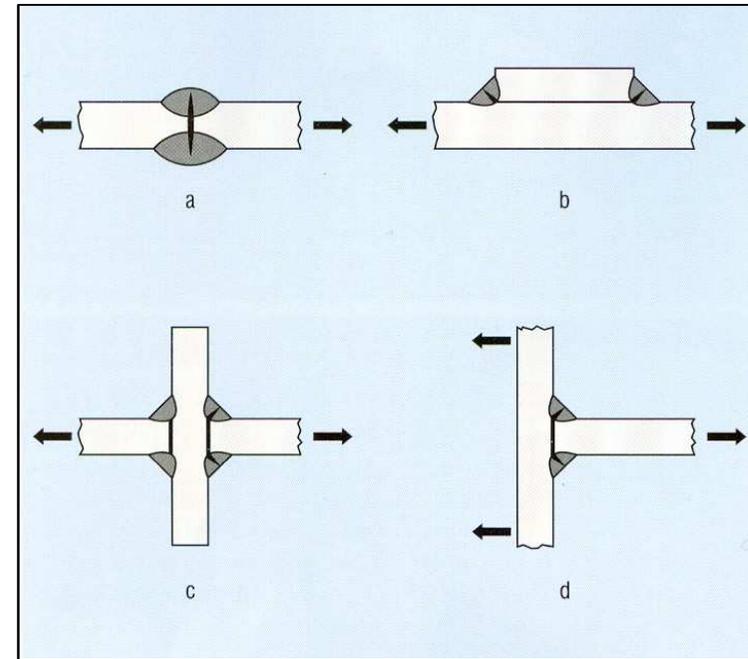
	S235 as welded	S690 PIT - treated
Skizze		
Fatigue	1.0	1.0
Stat. Strength	1.0	2.9
Weight / Mat.	1.0	0.6
Weld volume	1.0	1.0

	S235 as welded	S690 PIT - treated
Skizze		
Fatigue	1.0	1.0
Stat. Strength	1.0	2.9
Weight / Mat.	1.0	0.7
Weld volume	1.0	0.5

... also PIT has his limitations



...when having this kind of weld detail and/or load PIT is *more than qualified!* Because cracks arise at the surface.



...when having this kind of weld detail and/or load PIT is *less qualified!* This because cracks arise from the root area.

Reduction of the PIT effect can occur, when....

- the component after treatment is exposed to high temperatures
- the component after treatment is loaded in such way that stresses become near to or above the materials yield (high average stresses).

Under such circumstances the effect of the improved notch factor still will be present but the introduced compressive stresses will be reduced .

Consultation, Project Management
& Execution



I. Professional failure management in case of failures caused by fatigue.

II. Realisation of material / weight saving because of the PIT - effect

III. Installation and/or construction maintenance preventative & corrective PIT treatment



Distribution of PIT Systems

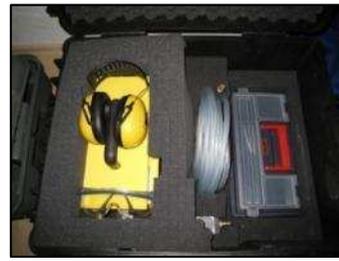


An artificial muscle, a new development of **FESTO**, is driven by way of compressed air. These motions are transferred as hammering movements on one or more pins.

By separate control of the frequency and pressure the impact intensity can be adjust to a optimum for the particular material in order to achieve the maximum effect.



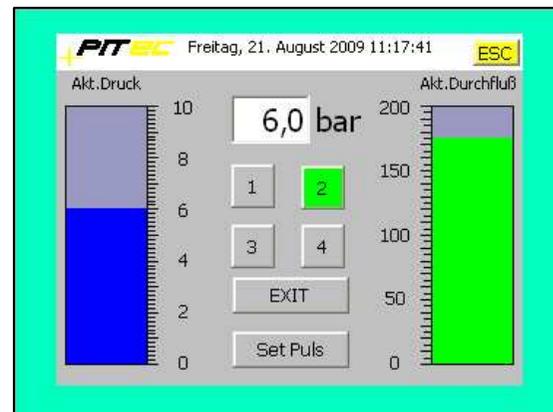
- compact design for best accessibility
- integrated lighting for the workspace
- Fine adjustment by separate control of frequency and pressure
- 4 individual programmable frequency steps
- Pin assortment for customized applications
- air cooling of the pins
- very low vibration level, approx. 5 m/s²
- can be applied in confined spaces (hand-held unit 24 V)

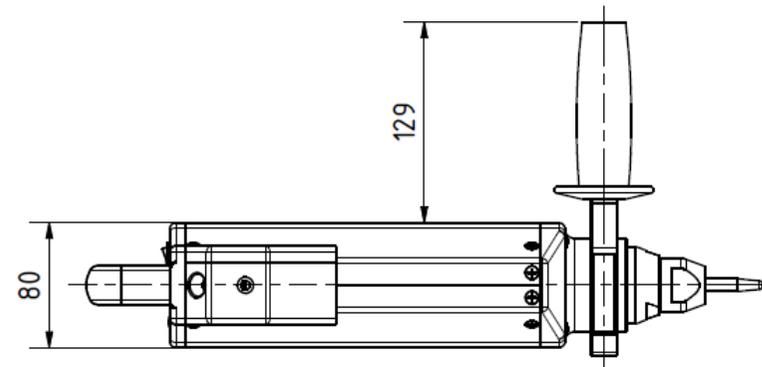
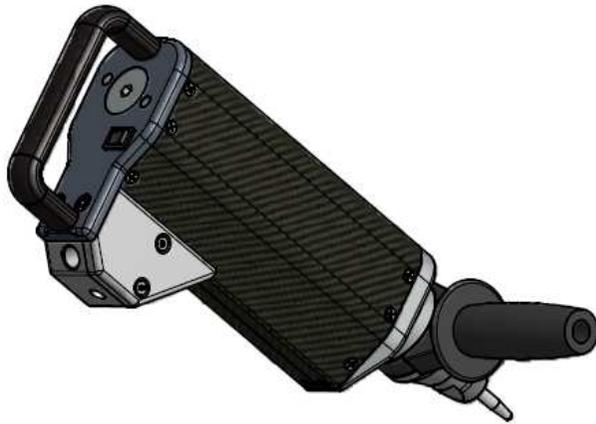
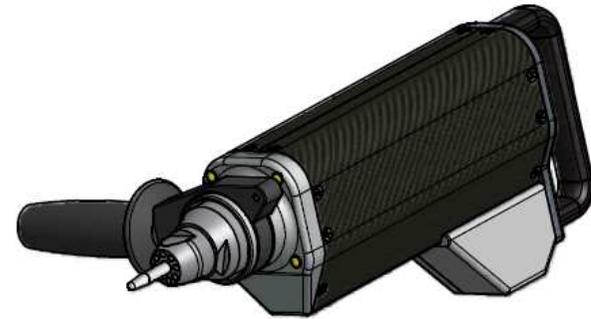
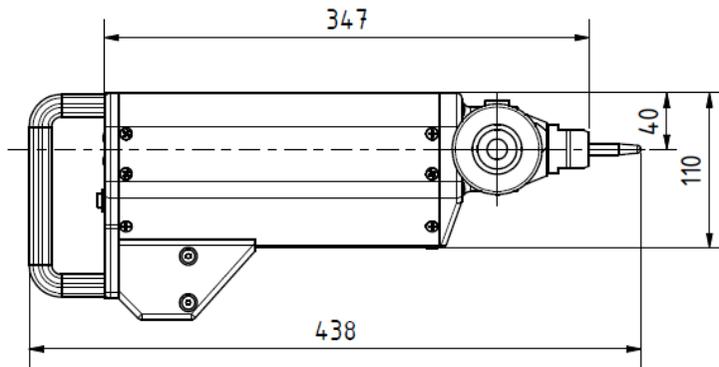


PIT-CPU Especially for the use in serial production

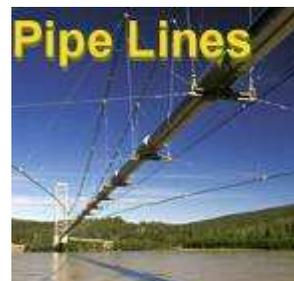
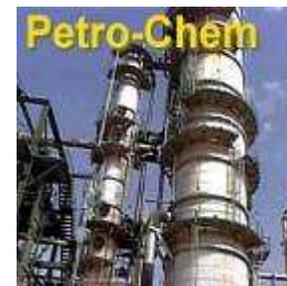
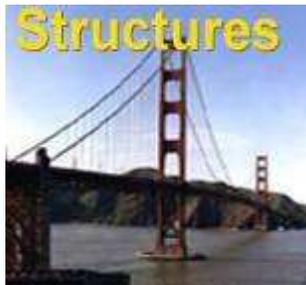


- Siemens touch screen, based on windows
- Self test with pressure and air volume control
- Chosen settings manually or by way of stored parameters
- Steady air pressure because of automatic balance system
- Data Interface
- Short user manual stored in system
- PIT-Almen-Intensity test function





*... everywhere where dynamic load
is applied to structures :*



Enhancing the structures Fatigue life by way of
corrective treatment of repair welds
and preventive treatment of further Hot Spots.



PIT Reference: Maintenance of a press



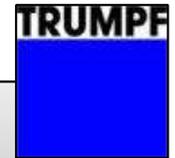
Treatment of a press in a truck manufacturing plant near Lyon:

- Fa. Schuler applied 2 new bearing plates with a diameter of 950 mm by way of welding
- PITEC afterwards replaced the residual tensile stresses by introducing compressive stresses



04/08/10

PIT Reference: Punching- and Nibbling machine



The company Trumpf is using PIT during new building as well as for repair projects
Results: the already good lifetime of the equipment is further extended.



Dillinger Hütte increases the availability and reliability of their installations through a good combination of corrective and preventive PIT treatment



04/08/10

BOMBARDIER is certainly one of the most famous manufacturers of rail vehicles.

Because of the companies experience they offers their clients also services in the area of accident repairs and modernization of existing vehicles. This includes the durability of executed repairs and extending the lifetime of the vehicles.

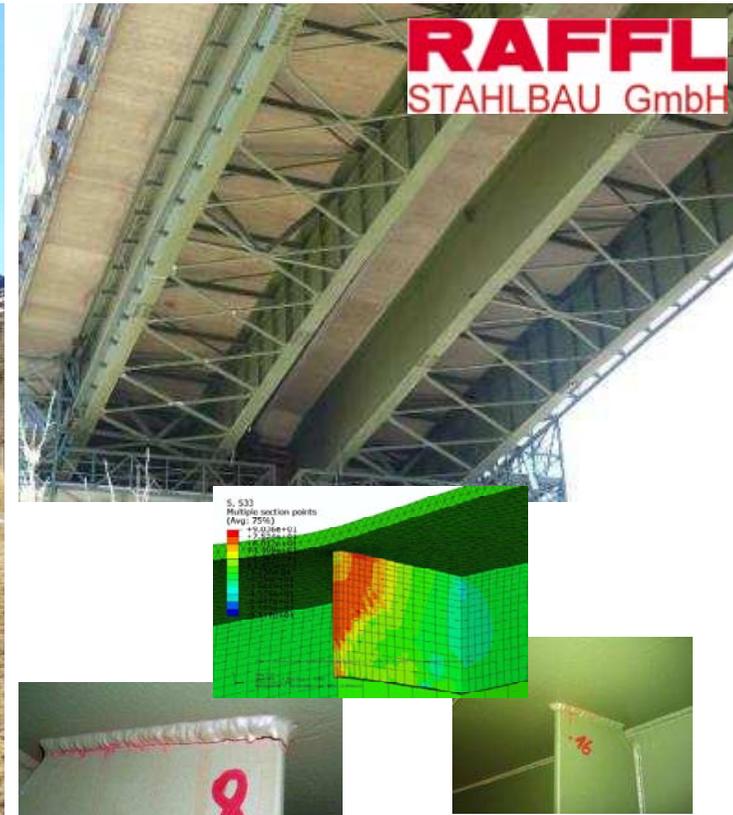
We are pleased that now the PIT technology as well can contribute here.



PIT Referenz: Retrofitting of the "Gschnitztal" bridge



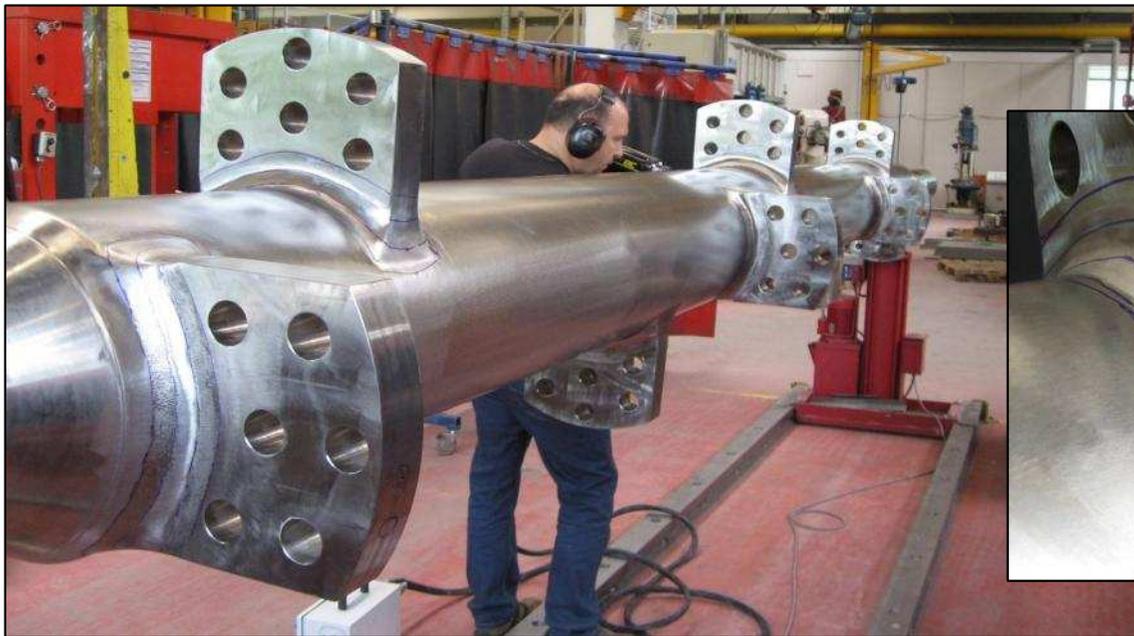
Additional improvement of the fatigue life of repaired welds by applying the PIT treatment afterwards



PIT Reference: Mixing shaft made of Duplex Stainless Steel



PIT-treatment of a mixer shaft / axle in Duplex
in order to improve its fatigue life



Enhancing the fatigue life of a cast iron part



PIT- Treatment of a prototype – Brake carrier in material EN-GJS-600



➤ Crack in the prototype – Brake Carrier after 2/3 of the required fatigue life.



PIT treatment of the stress hotspots by way of a concave pin.

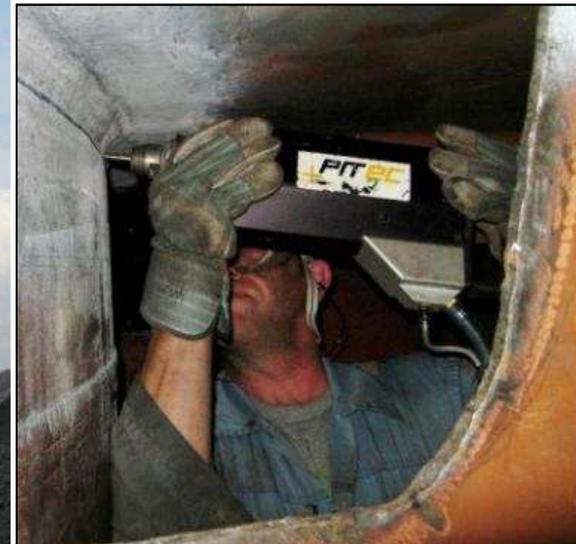
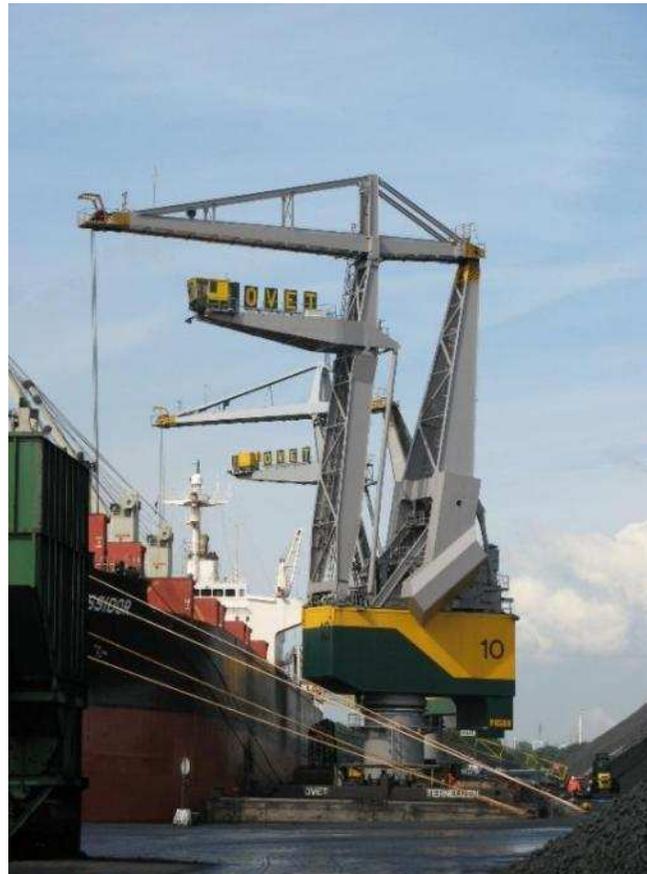


Fatigue life enhancement of 11 times compared to the untreated Brake Carrier
= 7,5 times more than the specified target

PIT Reference: Repairation of a port crane



PIT-Treatment of weld seams in the cranes monopole after repairing present fatigue cracks as well as preventative treatment of all other welds without cracks.



Also the development department of Volkswagen AG in Braunschweig is, because of an internal test program on specific components, convinced about the influence of the PIT effect.



Currently Volkswagen AG is investigating in cooperation with PITEC GmbH the various application Possibilities



...thank you for your attention!



For questions or additional information you may also contact:

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