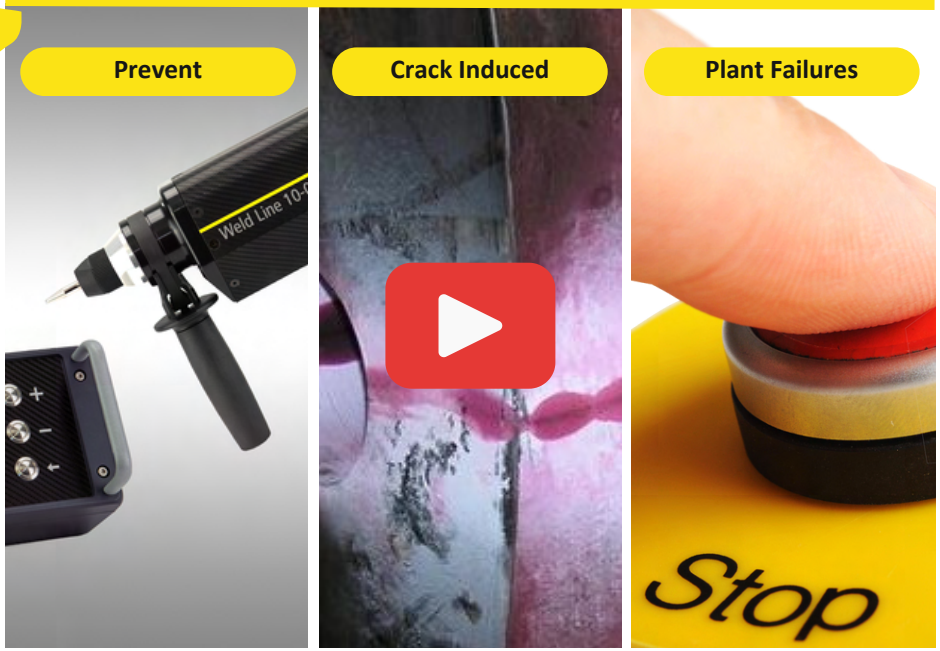
a FLIESS Company

PIT - the competitive advantage for manufacturers and operators of dynamically loaded constructions

Your competitive advantage

Reduce costs by avoiding plant or machine failures as an operator of dynamically loaded constructions



PIT provides you with the following benefits:

- reproducible increase in fatigue life
- prevention & avoidance of fatigue damage, even in preloaded constructions
- multiple increase in remaining service life
- prevention of stress corrosion cracking
- retrofit capability for the base frame

Your competitve advantage as a manufacturer

Save on material costs, labor time, as well as transport and assembly efforts by producing significantly more sustainably and economically.

PIT provides you with the following benefits:

- achieving higher FAT-Classes
- significant savings potential in terms of material usage
- senseful use of high strength steel under fatigue loading
- cost-effective manufacturin, faster and more reproducible than conventional methods
- enhanced component safety regarding fatigue resistance

Do you achieve the required strength through complex constructions?

*Your **designers** and **production managers***
*are constantly facing these **challenges**:*

fatigue design
according FAT-Classes

utilizing material saving potentials
without compromising component safety

implementing complex structural solutions in production
e.g. stiffener plates

economical production
using elaborate methods (e.g. TIG/Grinding)

or ...

A crack induced machine or plant failure occurs at an inopportune time

*Your **maintenance** and **production managers***
*are constantly facing these **challenges**:*

production comes to a halt due to crack induced plant failure

substantianal downtime and repair costs arise

despite costly repairs, the remaining lifespan only increases insufficiently

sustaining operating machines and plants beyond their fatigue life

This is how we support you...

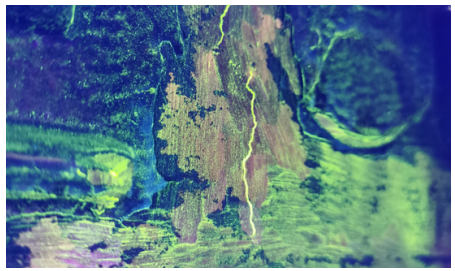
... as a manufacturer in turning your challenges into competitive advantages

- **produce more sustainably**
  *material savings of up to **40%***
- **avoid complex solutions in design**
- **improve component safety**
  at lower costs
- **economical post-treatment with high reproducibility**

... as an operator in preventing fatigue induced failures

- **proatively prevent the formation of fatigue cracks**
- **avoid costly repairs due to fatigue damage**
- **significantly extend the remaining lifespan of your plant**
- **reduced costs & delivery issues**

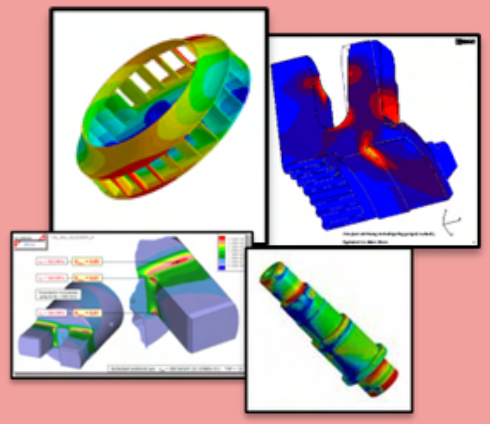
Oscillating loads sooner or later lead to fatigue damage on every component



Crack initiation always occurs at the
weakest point of **the structure**

the causes:

Tensile stresses

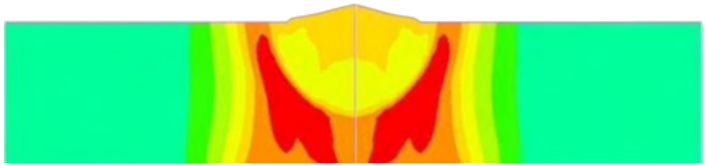


Notch effects

- roll damage
- stiffness changes
- hole edges
- bearing seats
- threads
- keyways

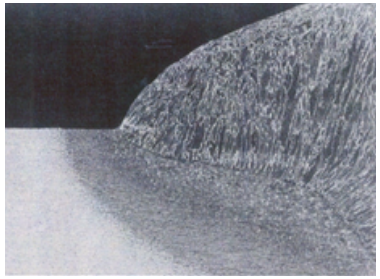
Weld seams

are vulnerable due to both factors



high residual tensile stresses

+



geometric notch

=

fatigue crack

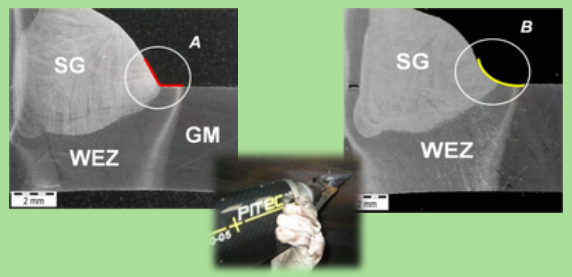
the PIT-Effect

PIT is a highly reproducible process

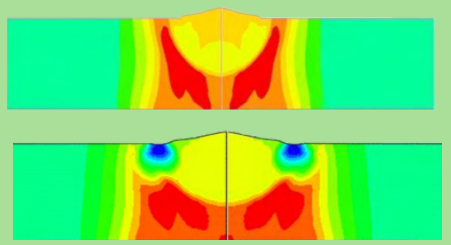
that deliberately induces **compressive residual stresses** into **critical areas** of your components and geometrically optimizes notches.

In addition to the numerous scientific evidences of the **HFMI effect** itself, the University of Stuttgart has specifically confirmed the **high reproducibility of PIT** without the risk of over-treatment.

As a result, the formation of fatigue cracks is counteracted



Notches are geometrically optimized in a way that significantly improves the notch factor



Near-surface tensile residual stresses are intentionally superimposed with high compressive residual stresses

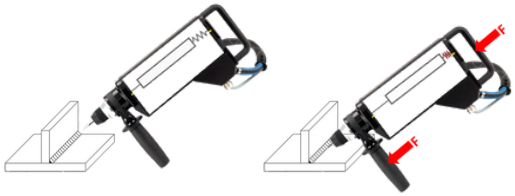
the PIT-System

HFMI is much more than just hammer peening with higher fequency

The PIT control unit allows for separate regulation of frequency and pressure. This enables us to achieve the optimal impact intensity for the greatest possible result without the risk of over-treatment.

Due to the spring-loaded impact mechanism in the handheld device, the user does not influence the intensity applied to the component.

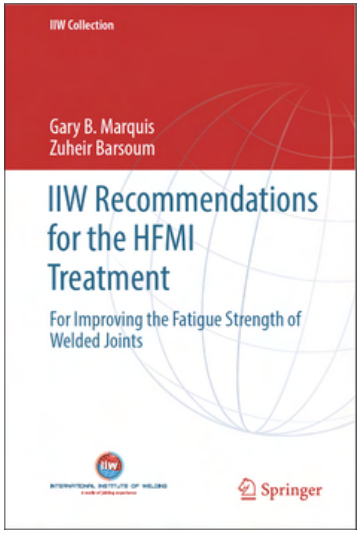
These advantages result in the significant effects of PIT with maximum reproducibility.



PIT - the leading HFMI process

The effectiveness of HFMI is already listed in the following standards

IIW



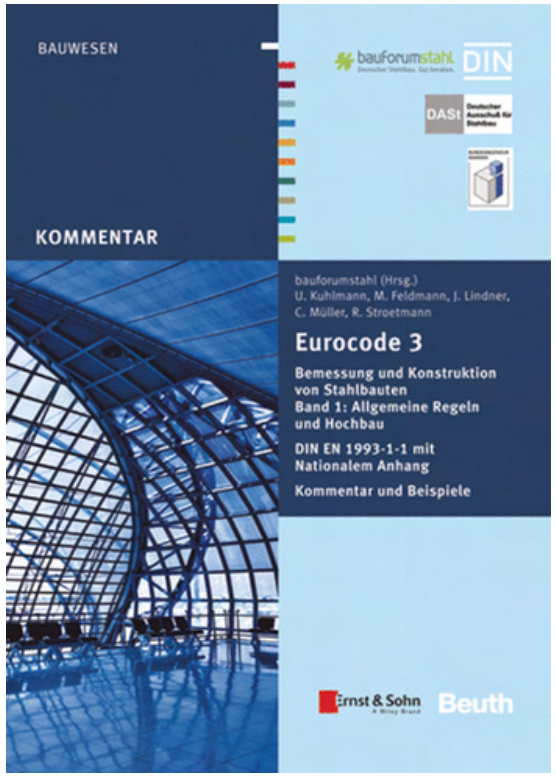
DASt - Guideline

Eurocode 3 - draft 2023-03

DIN EN 1993-1-9: 2023-03

provides design concepts for the proof of fatigue resistance of steel structures

prEN 1993-1-9:2021 (E)



Further standards such as DIN EN 15085-3 and DIN EN 13445 will follow

We offer you worldwide:

PIT-Application Consultation

Benefit from our extensive experience and let us provide tailored advice for your specific needs. We will demonstrate the potential of a PIT treatment that is perfectly customized to your application.

PIT-Operator Training

Thanks to the practical training, your employees will gain a strong understanding of the technology's effects, enabling a smooth and rapid implementation of the process with sustained quality.

PIT-System Sale

Our PIT System Weld Line 10 is suitable for both manual and automated use with robots. Additionally, we offer a PIT System designed for underwater applications.

PIT-Equipment

In addition to a wide range of various bolt radii and lengths, PITEC also provides quality tools, including an LED magnifier for visual inspection and a PIT Intensity Kit for regular impact intensity checks.

Rental of PIT-Systems

Do you only need our high-quality PIT systems temporarily? No problem, we are happy to provide our rental equipment to you.

PIT-Services On Site

Let our experienced team support you with a worldwide PIT treatment and benefit from the on-demand PIT effect.

PIT-Quality Monitoring

If you have PIT applied by suppliers or partners, we offer quality monitoring as a 'third party' service as needed.

Increase your FAT classes significantly

Direct comparision with IIW recommendations highlights the technical and economical potential most prominently

FAT Klassen der Details im geschweißten Zustand	Streckgrenze fy	Schleifen		WIG/TIG Dressing		Hammer-/Needle Peening		PIT	
		Faktoren	FAT-Klassen	Faktoren	FAT-Klassen	Faktoren	FAT-Klassen	Faktoren	FAT-Klassen
									
		Neigung m=3		Neigung m=3		Neigung m=3		Neigung m=5	
Längssteife									
FAT 71 	235 fy ≤ 355	1,30	FAT 90	1,30	FAT 90	1,30	FAT 90	1,57	FAT 112
	> 355 fy ≤ 550					1,50	FAT 100	1,76	FAT 125
	> 550 fy ≤ 750							1,97	FAT 140
	> 750 fy ≤ 950							2,25	FAT 160
Quersteife									
FAT 80 	235 fy ≤ 355	1,30	FAT 100	1,30	FAT 100	1,30	FAT 100	1,56	FAT 125
	> 355 fy ≤ 550					1,50	FAT 112	1,75	FAT 140
	> 550 fy ≤ 750							2,00	FAT 160
	> 750 fy ≤ 950							2,25	FAT 180
Stumpfstoß									
FAT 90 	235 fy ≤ 355	1,30	FAT 112	1,30	FAT 112	1,30	FAT 112	1,55	FAT 140
	> 355 fy ≤ 550					1,50	FAT 125	1,77	FAT 160
	> 550 fy ≤ 750							2,00	FAT 180
	> 750 fy ≤ 950							2,00	FAT 180
		> hohes Fehlerpotential - Unterschliffod. Schleifbrand - zusätzliche Kerben od. Riefen > Staub/Lärm/zeitintensiv		> nur in Wannenlage > Spannungsprofil		> wenig reproduzierbar > hohe Handarmvibration		> höchste Verbesserung > hohe Reproduzierbarkeit > nachhaltige Qualitätssicherung > ~ 20 cm/min.	

Referenzen:
> Hobbacher A., IIW recommendations for fatigue design of welded joints and components, WRC bulletin 520, New York: The Welding Research Council, 2009
> Marquis et al., Fatigue strength improvement of steel structures by high-frequency mechanical impact: proposed fatigue assessment guidelines, Weld World 57, pp. 803-822, 2013
> IIW Recommendations on High Frequency Mechanical Impact (HFMI) Treatment for Improving the Fatigue Strength of Welded Joints

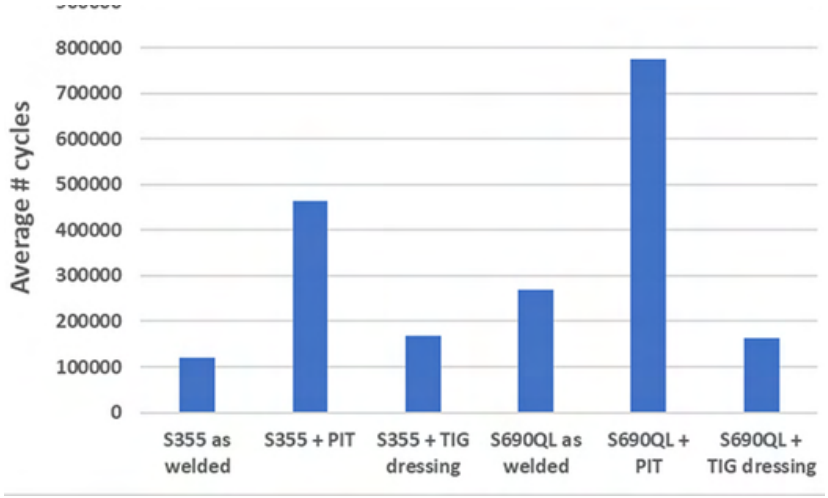
PIT-Technology vs. Burr Grinding

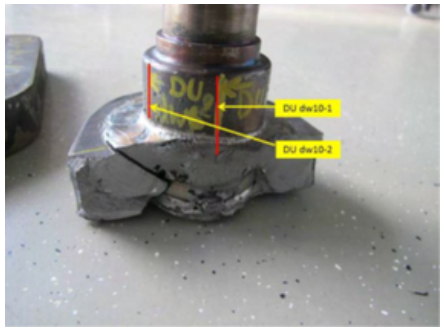
- high time efficiency up to 90%
- almost no potential for errors
- almost no risk of injury
- no dust exposure
- highest increase factor to FAT classes

- significant time investment
- partial re-welding is required
- high potential for errors
- high risk of injury
- low increase factor to FAT classes

PIT-Technology vs. TIG

e.g. steering lever for agricultural machines





without PIT, the crack occurs directly at the weld transition

with PIT, the crack occurs significantly later in the HAZ

In collaboration between OCAS Institute for Steel Applications and BIL, the Belgian Welding Institute

SENNEBOGEN

TRUMPF

ArcelorMittal

SCHULER
Member of the ANDRITZ GROUP

BOMBARDIER

SMS group

ALUNORF

GRIMME

LIEBHERR

MKG

LEITWIND

HOFFMEIER
INDUSTRIEANLAGEN

... and many other customers are benefiting from the advantages of PIT

MKG - Maschinen und Kranbau

“At MKG, alongside potential material savings, we anticipate utilizing PIT to optimize
hotspots without the need for complex manufacturing solutions to defuse them.

Today, our first PIT system was delivered and user training was conducted for our employees.

The training content was highly engaging, and the necessary understanding of fatigue causes as well as the effects of PIT were conveyed in an easily comprehensible manner.”

Christian Bley - Head of Structural Department and Welding Supervision - Garrel 07/23

Holmer Maschinenbau

HOLMER

PIT enhances the reliability of our products making them even more appealing to our customers

Various training sessions and seminars on welds, quality-conscious design, and weld damage drew our attention to the possibility of extending the lifespan of our welds through HFMI.

The published standards so far (IIW recommendations, DASt-Rili 26, EN 15085-3), confirming its effectiveness, along with companies we know that have been using this technology with a positive impact for some time, finally convinced us of HFMI.

In choosing the provider, we opted for PITEC due to their in-depth knowledge, experience, and convincing product.

Werner März - Structural and Welding Engineer - Eggmühl 03/2023

Trumpf Machines SARL

“We at Trumpf were convinced of the HFMI effects as early as 2009

and, after comparing several providers, chose PIT. The fact that the systems we purchased back then still work flawlessly today shows that we made the right decision.
In the event of a service case, PITEC always responds quickly and reliably, making our collaboration highly efficient.”

Damien Clog - Welding Technology

SENNEBOGEN

SENNEBOGEN

> **By applying the PIT - Process**
> SENNEBOGEN was able to significantly extend the already impressive lifespan of its steel components. And this is also confirmed by the satisfaction of our customers.

Dipl. Ing Ldg J. Reischer, IWE + IWI Head of Steel Constructions

Beckmann und Volmer Service GmbH

A damage intervall of only 6 months
prompted us to first employ PIT technology at the end of 2012.
As no new crack has emerged after more than 2 years, we will be relying on PIT for our customers in the future.

Vito Pirone - Salzbergen 04.04.2013

Construction of the world's largest underfloor press

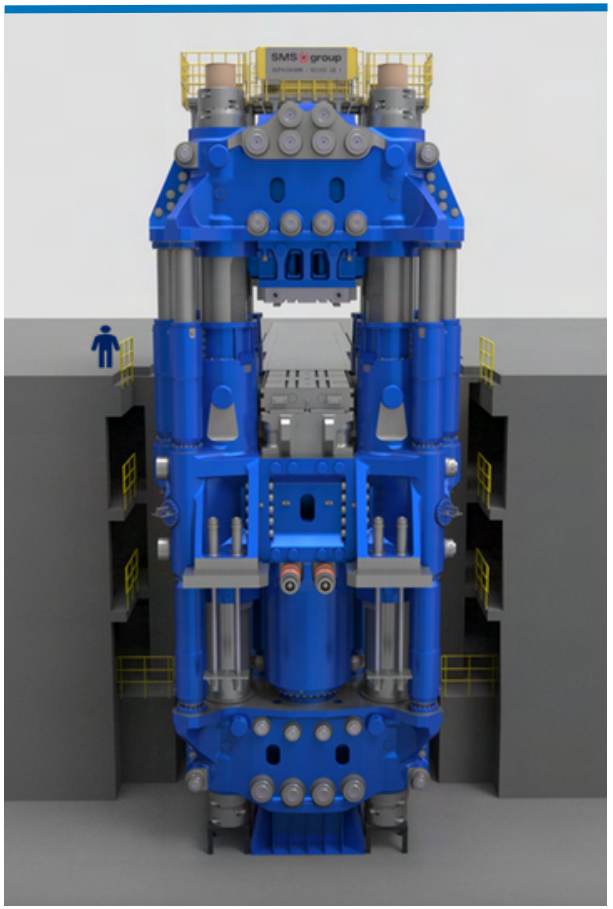
SMS group

The SMS Group is construction a new hydraulic press with a force of 540 MN

at the Paramount USA site on behalf of the OTTO FUCHS Group, at its subsidiary Weber Metals.

To achieve the required strength values according to FKM, SMS Group decided to treat the clear view areas of the bore extensively using our PIT process.

It is also noteworthy in this context that despite a total area of over 8m², SMS Group opted for PIT instead of shot blasting.



Refurbishment of steam drums at the Munich City heating plant

Despite professional repairs cracks repeatedly appeared in the circumferential seams of the steam drums

As a measure, in May 2011, in collaboration with TÜV Süd, it was decided to treat the entire seam area including the heat-affected zone (HAZ) with PIT on two drums.
However, due to the high operating temperatures exceeding 500°C, we were skeptical, even with PITEC, whether the introduced compressive residual stresses would not be significantly reduced and thus affect a sustainable outcome.

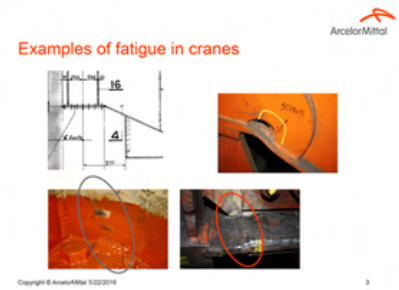
In February 2020, the PIT team learned that no new cracks have occurred in the PIT-treated area during the regular inspections up to this day.

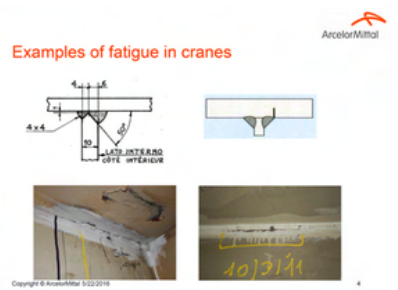
Maintenance Arcelor Mittal

In the belgian ArcelorMittal plant in Ghent, 8000 cracks were detected in the area of the crane systems in 2012

Through their R&D project at their own OCAS Institute, they recognized PIT as the most promising solution in 2014 and implemented the process in their maintenance operations.

Five years later, in 2019, the number of detected cracks had decreased to just 700. This corresponded to a reduction of over 90%!





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Contact Us

Headquarters

Essenberger Straße 85-93
D-47059 Duisburg

Sales & Technical Support

Siemensstraße 1b
D-50170 Kerpen

+49 (0) 2273 / 95108-60

info@pitec-gmbh.com

PITEC Deutschland GmbH