Pipeline Surface Preparation

JF DODDEMA
CEO MONTI GROUP

EXPERT ISO 21809-3 & MEMBER OF SC12 AND SC14
IPLOCA MEMBER SINCE 2019
IPLOCA ROME 2023

This is what I had to learn when I started in 1998

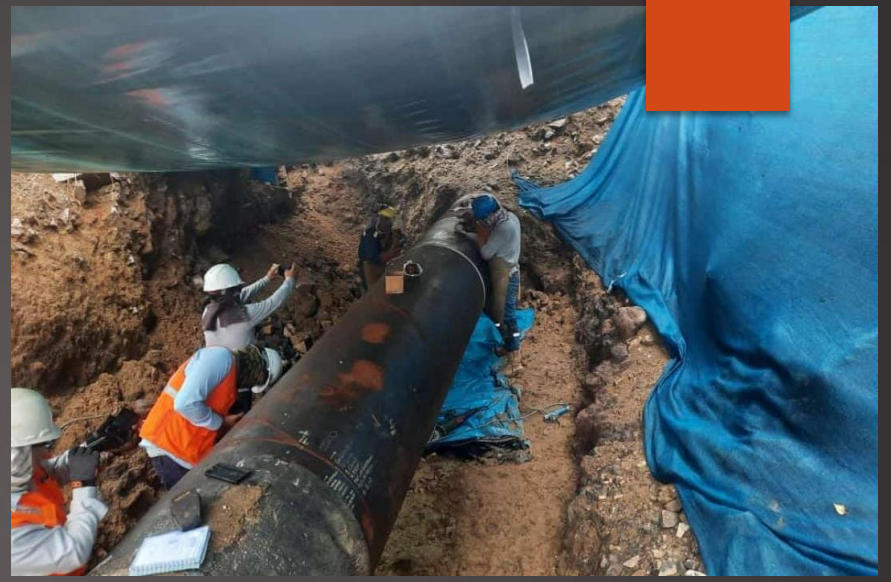
80% of the success of my liquid curing coating is depending on surface preparation/application


83%
INADEQUATE SURFACE PREPARATION
Corrosion is often an electrochemical reaction, whereby oxygen and water cause iron to rust or copper to turn green. Corrosion causes enormous economic damage - no less than approximately four percent of the Gross National Product. Parts that are affected by corrosion must be treated or re-
The solution for corrosion consists of removing one or more of the three requiredcomponents - water, oxygen or the electrochemical reaction. Traditional coatings for metals, such as bitu-
THE WORLD OF STEEL
1% DEFECTIVE COATING MATERIALS
11% APPLICATION ERRORS
6% POOR SPECIFICATION COATING SELECTION

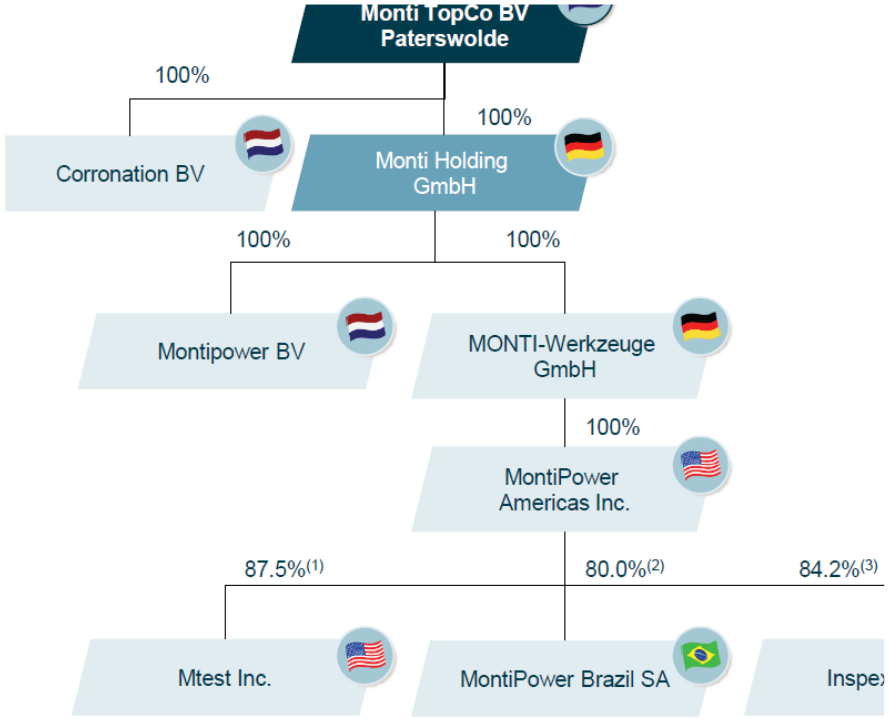
Source:AMPP

Take Away's for Today

- Coating Performance
- Cleanliness
- Profile (Roughness)
- HSE/Environmental
- Productivity/Repeatability
- Norms & Standards
- New, Rehab, Repair
- Training/Certificates
- Developments



Production Facility Hennef, near Bonn in Germany



Surface Prep + Testkits for MIC, Chromate 6 and other Corrosion services

Cordless and with dust/paint particle suction control

Yearly

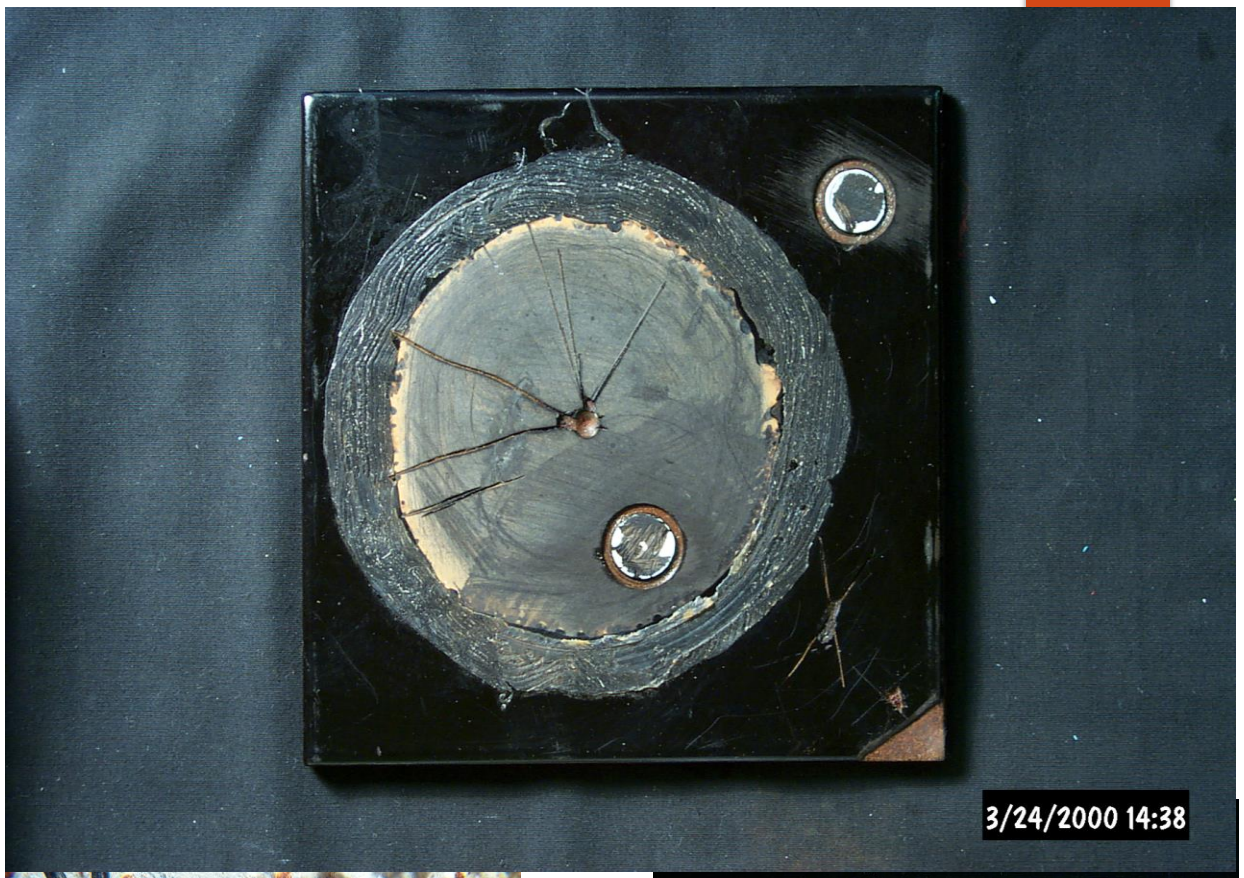
15,000 Tools/Machines for operators around the world

equals ca. 1 Million m2 Abrasive Blast Finish Quality (recurring)

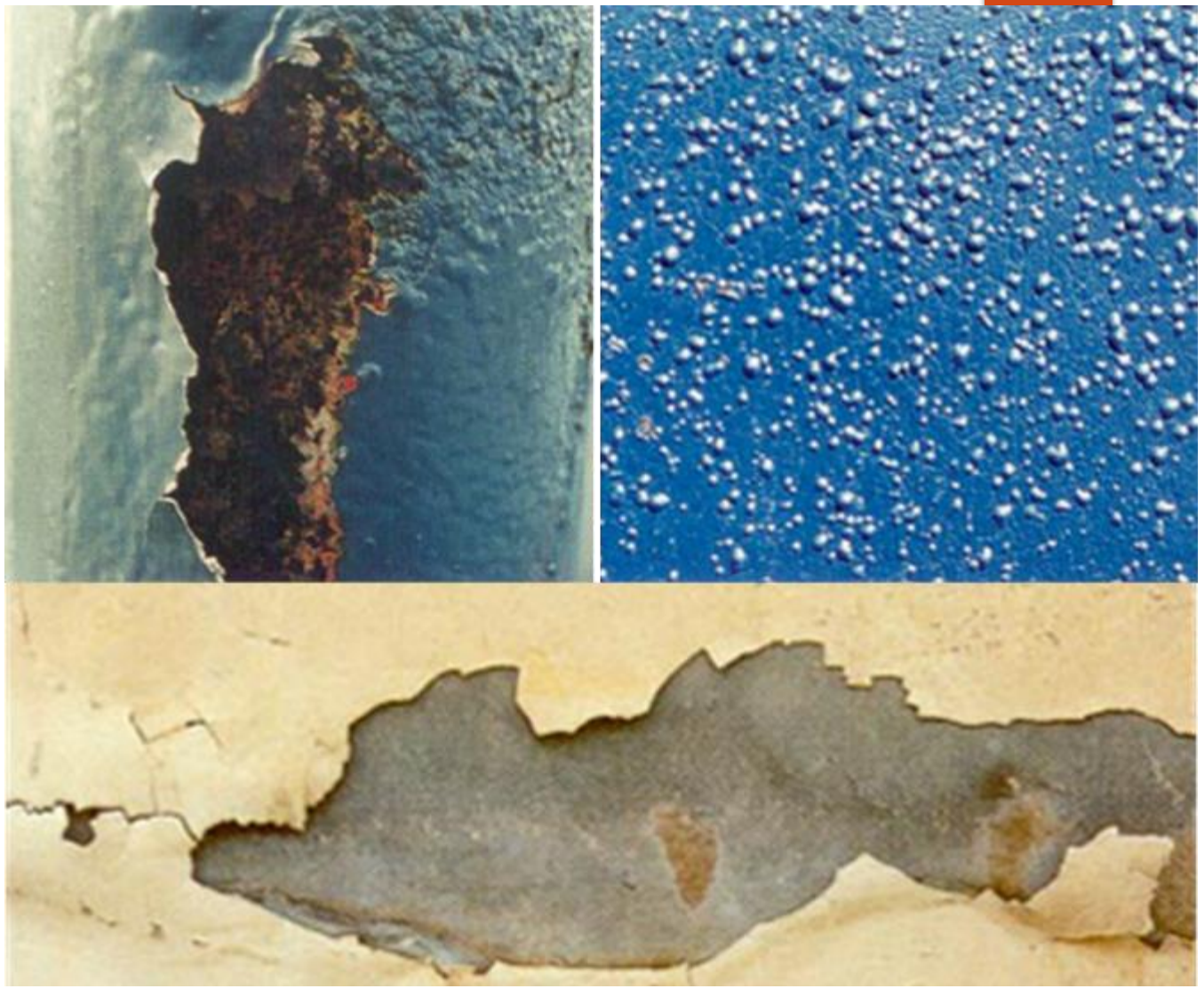
Note: the ‘blastingeffect’ can depend on steel thicknesses/hardness

Prevent Cathodic Disbondment

- Cathodic disbondment resistance in relation to Gritblasting versus Bristle Blasting with different millscale, dustlevels for coatings



Prevent Loss of Adhesion

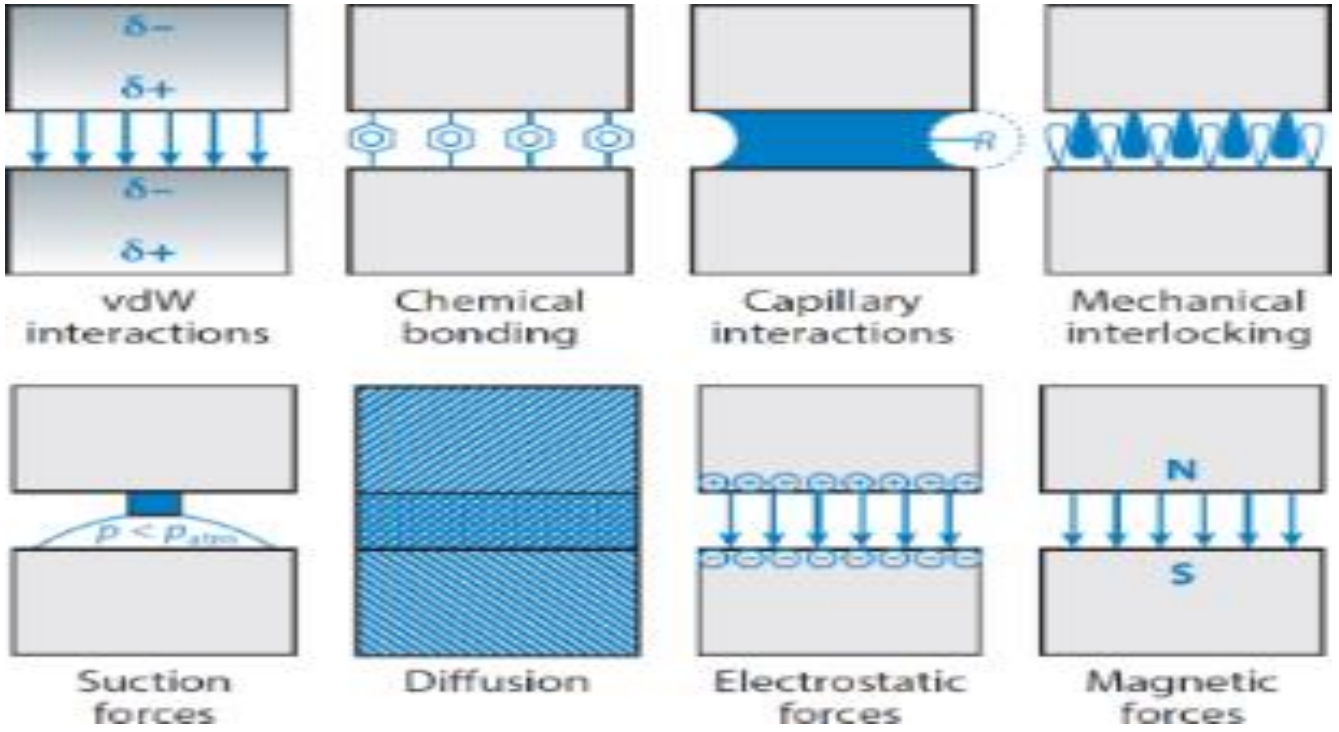


The Need for Surface Preparation is different per Pipecoating Type

- Epoxies
- Polyurethanes
- FBE (standalone or 2LPE/3LPE)
- Polyurea's
- Thermal Spray Alu Coatings
- Butyl primers
- 'visco-elastics'
- Wax-based
- Bitumen Primers

Adhesion Mechanisms of Coatings

- VanderWaal's
- Mechanical
- Chemical
- Dispersive
- Electrostatic
- Diffusive



Remember:
Cleanliness is important for chemical bonding of liquid curing coatings

Roughness/Profile is for mechanical adhesion

What's is Surface Preparation

Simply, it's preparing the surface to accept a coating/glue or other operations.

Essential for Surface Preparation is:

Surface Cleanliness salts, chlorides, dust, grease, oil, fat	Removal Millscale, Existing Coatings, Rust	Surface Profile

Pipeline

Steel
Stainless
Duplex
Plastic
GRE
GRP

How do we achieve quality of surface prep today (open or closed cycle)?

Some Coatings Manufacturers say St2 is sufficient for repair and rehab work

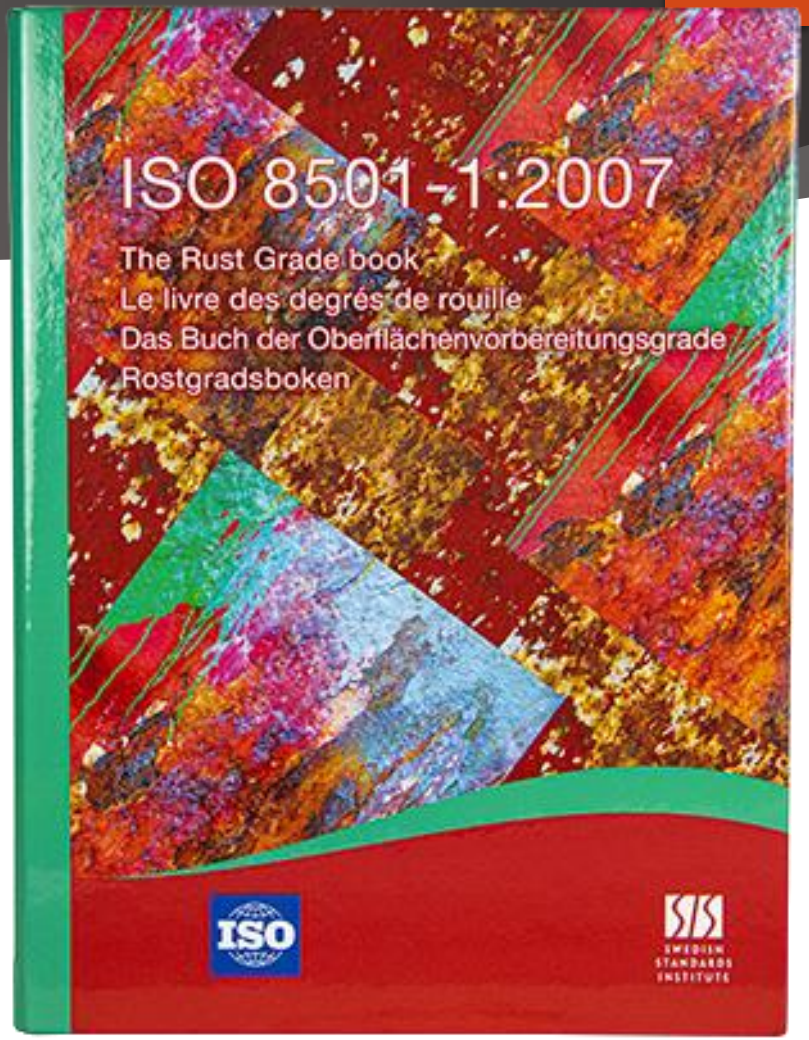
- Hand tool

Some prefer St3 powertool as proper prep work

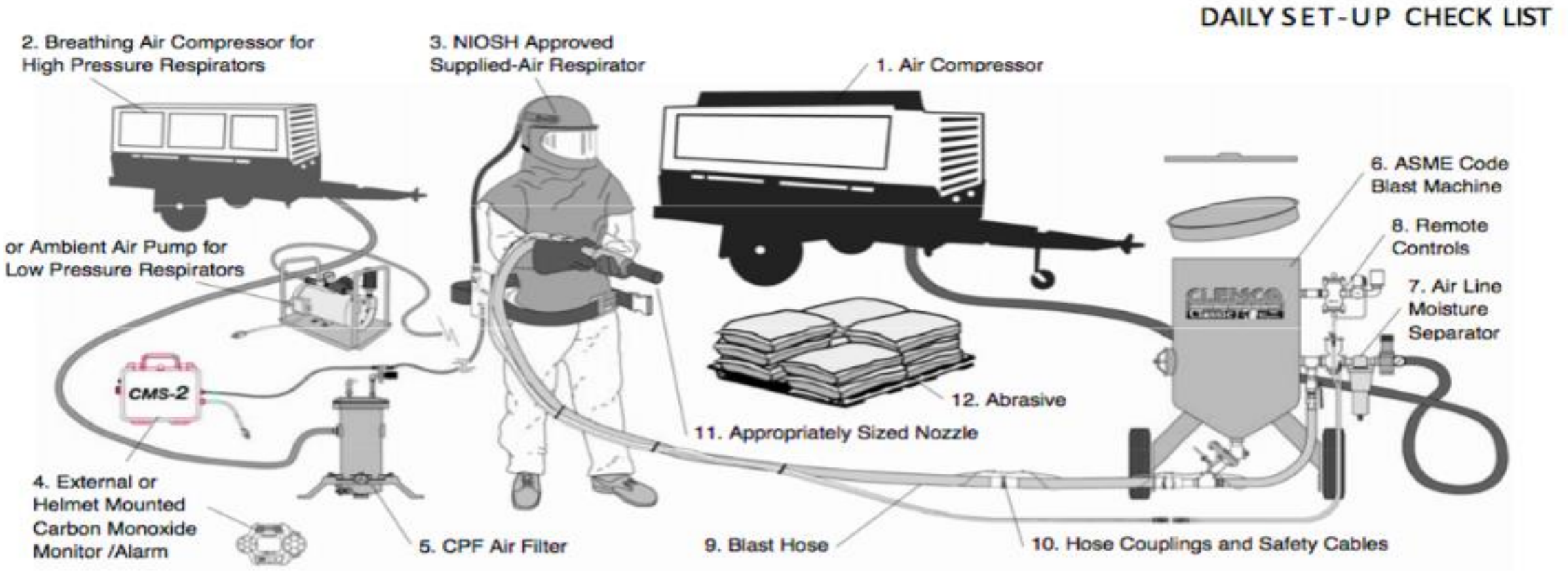
1. HIGH RPM
2. VIBRATION
3. NOISE
4. SMEARING EFFECT
5. BURNISHING EFFECT SUBSTRATE
6. CHANGES SURFACE TENSION OF SUBSTRATE

What's Are The Current Standards for Cleaning?

- ISO 8501-1 Cleaning Pictorial Standard for an Assessment
  - ST 2 Thorough Hand and Power Tool Cleaning
  - ST 3 Very Thorough Hand and Power Tool Cleaning



Loose Abrasive Blasting is the normative method for Sa Cleanliness Grades such as Sa1, Sa2,5 etc



Cleanliness Grades For Loose Abrasive Blasting at ISO 8501-1

- ISO Sa 1 Light Blast Cleaning
- ISO Sa 2 Thorough Blast Cleaning
- ISO Sa 2 ½ Very Thorough Blast Cleaning
- ISO Sa 3 Blast Cleaning to Visually Clean Steel

Also for SSPC, cleanliness is defined by the method

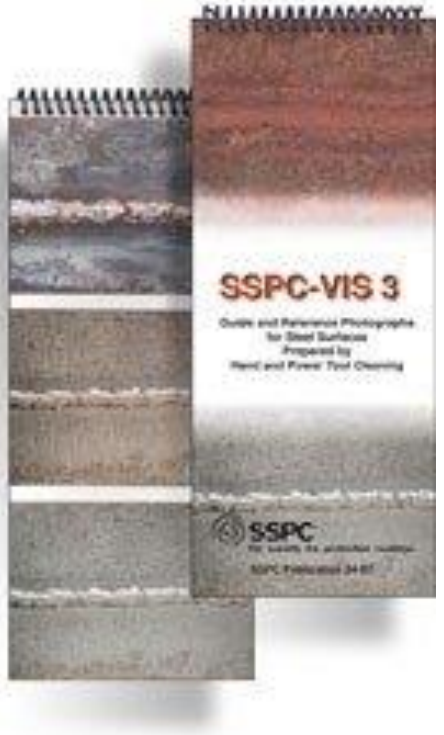
- Powertool Result VIS 3 Pictorial Standard
- Loose Abrasive Blasting Result VIS 1

`

SSPC Power Tool Standard – VIS 3

- SSPC SP 11 Power Tool Cleaning to Bare Metal (Section 2.1.1 - requires a minimum of 1 mil profile)

- SSPC SP 15 Commercial Grade Power-Tool Cleaning (Section 2.5 - requires a minimum of 1 mil profile)



Other alternatives for Cleaning (not profiling)

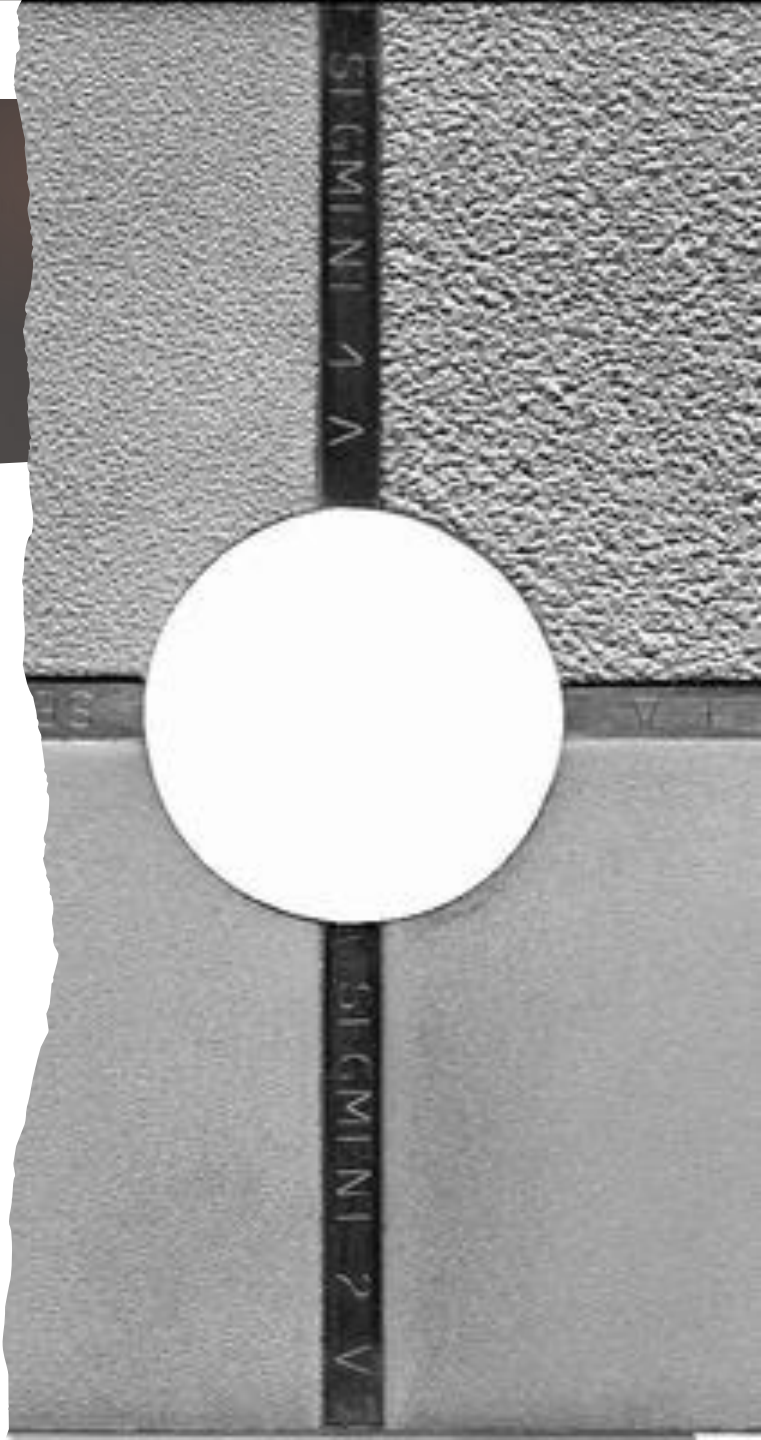
- Waterjetting – HPWJ, UHPWJ
- Vapour blasting
- Dry Ice Blasting
- Lasercleaning
- Induction removal of old bitumen or PE/PP

Bristle Blasting > 10,000 Effective Strikes per Second

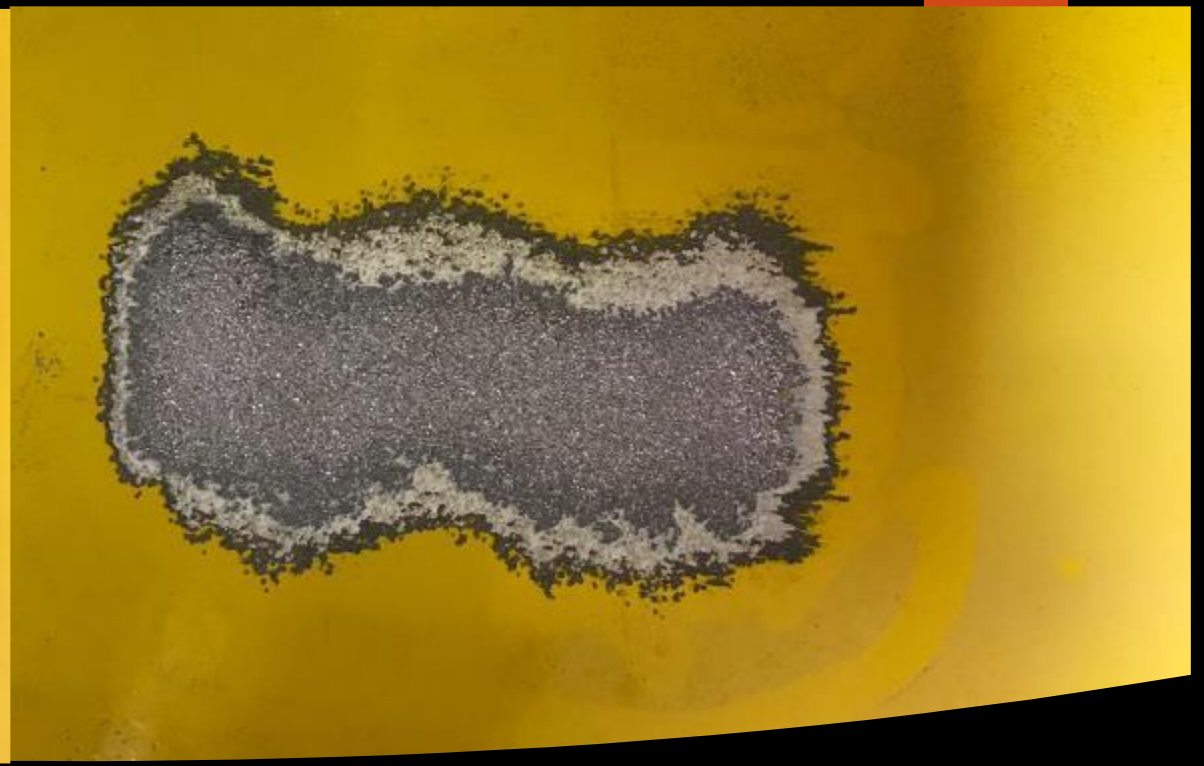
- Results up to max. SSPC-SP5/ NACE No.1and ISO 8501-1 Sa3
- Always above 50 Micron Rz for Bristle Blaster (with accelerator bar) and 30 Micron MBX
- With various amplitude for reliable coating adhesion and corrosion resistance

Surface Profile Test

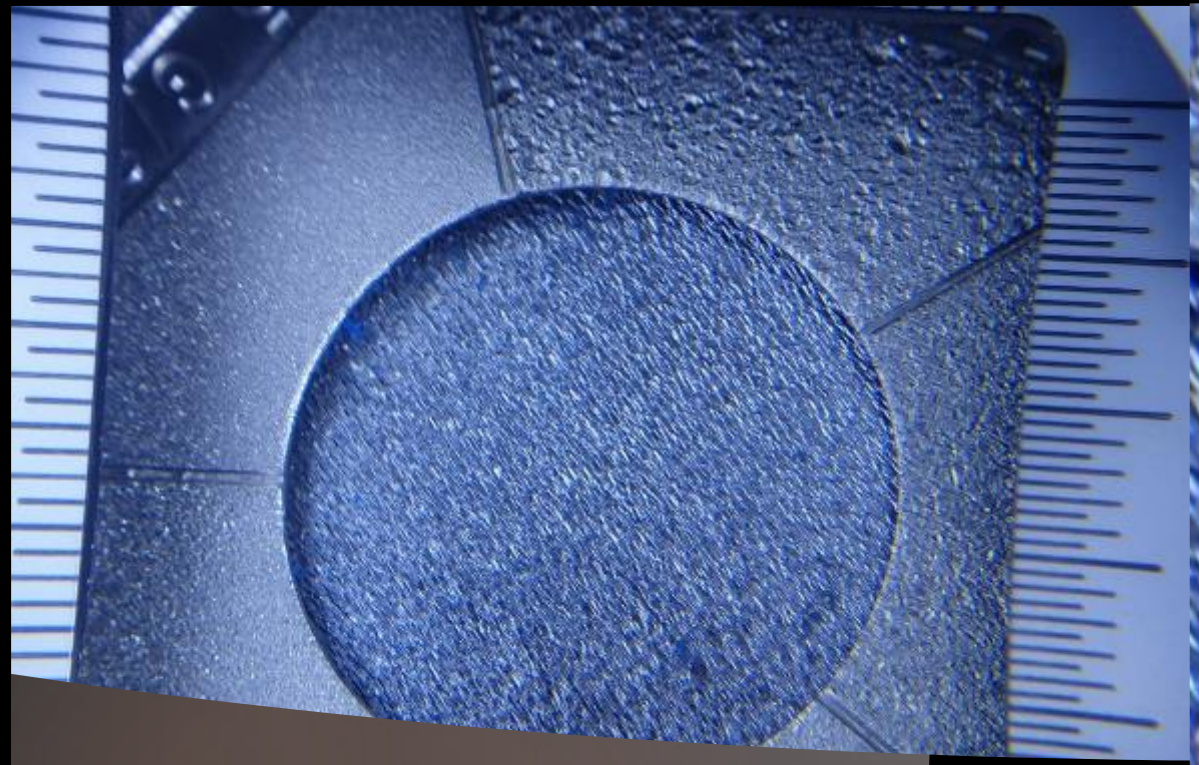
- Surface profile refers to the contour or roughness of the surface.
- This surface roughness has a number of functions
  - Increases surface area
  - Increases adhesion (mechanical)
  - Affects the coverage effect of the coating

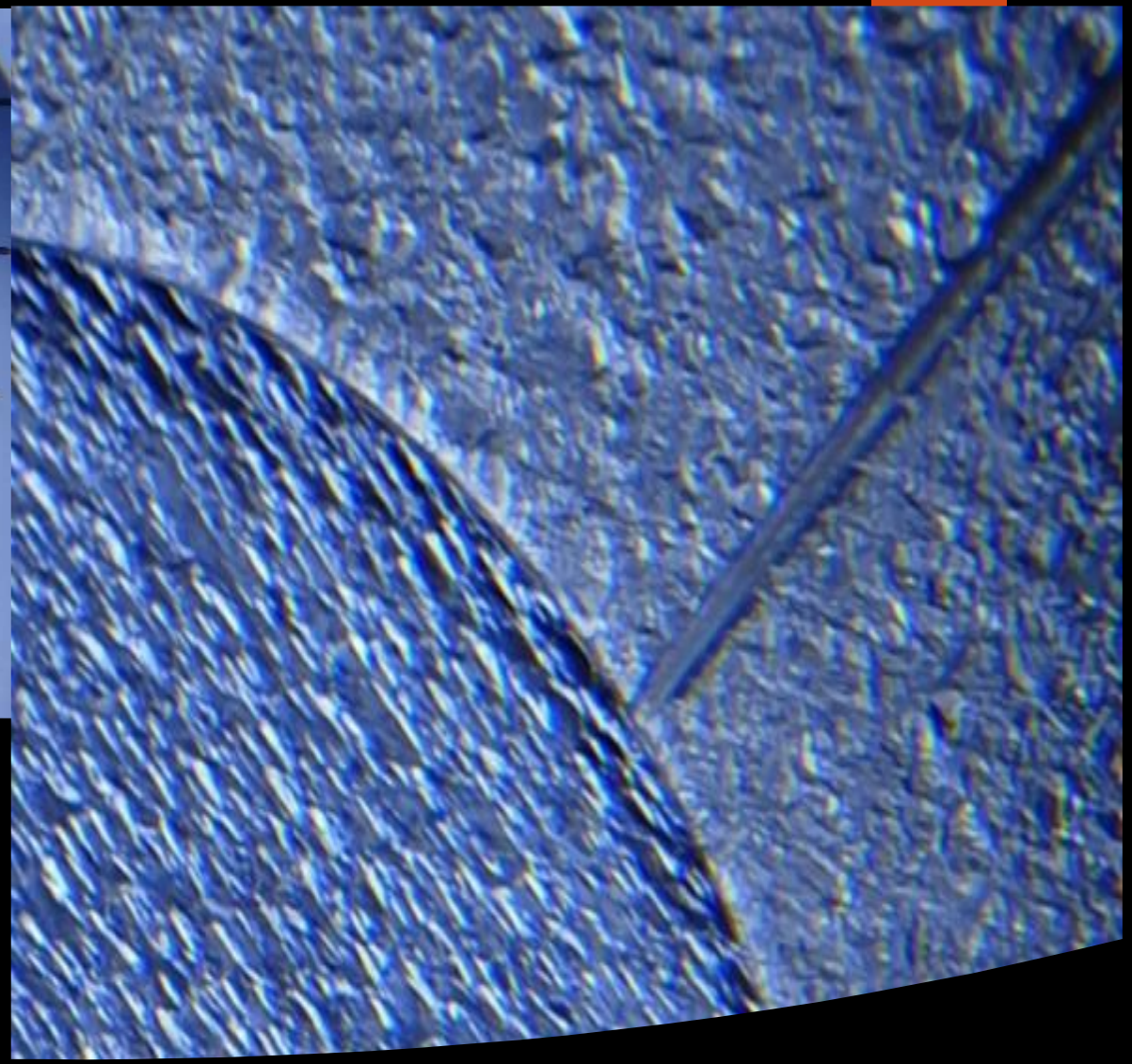


Surface roughness Comparator…

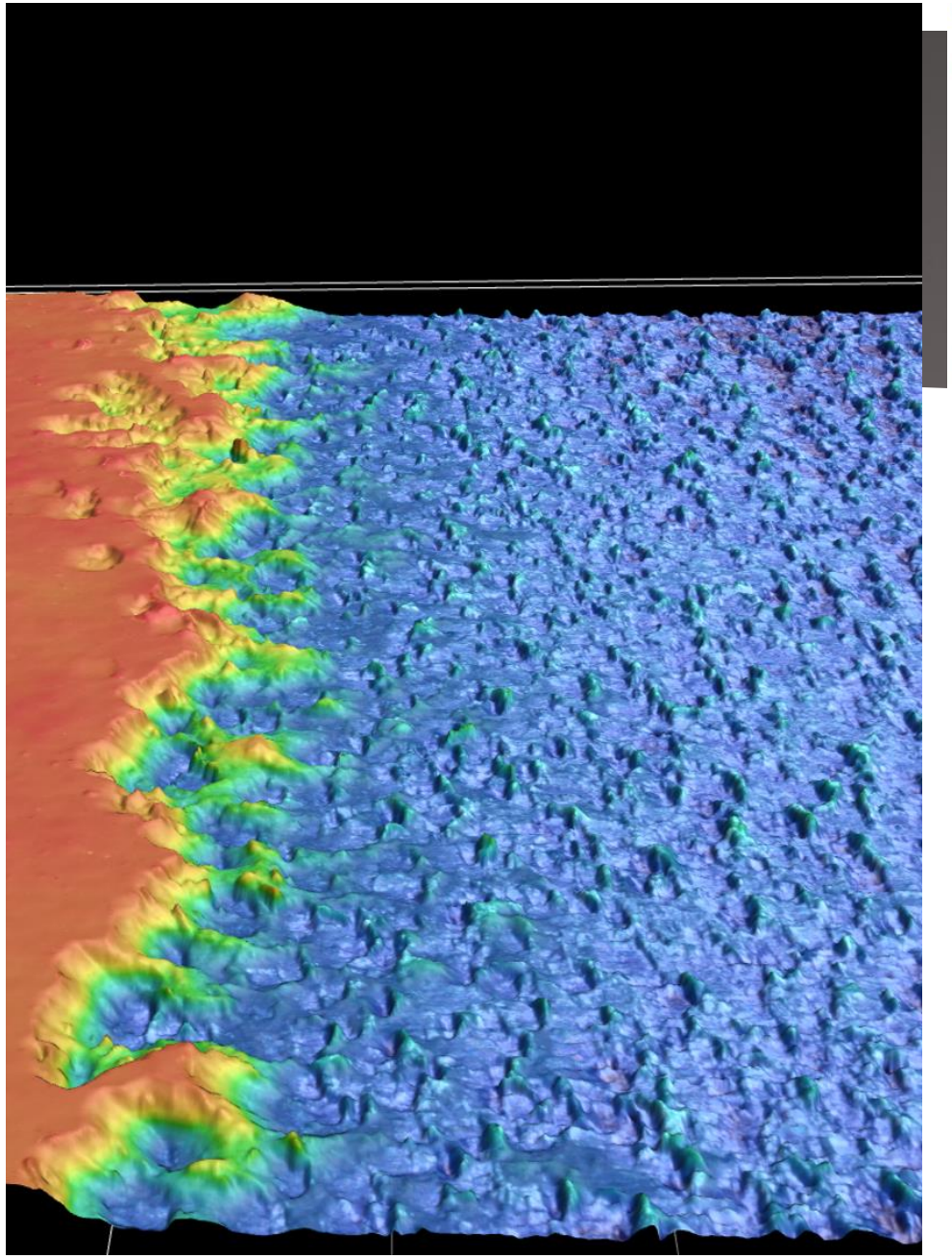


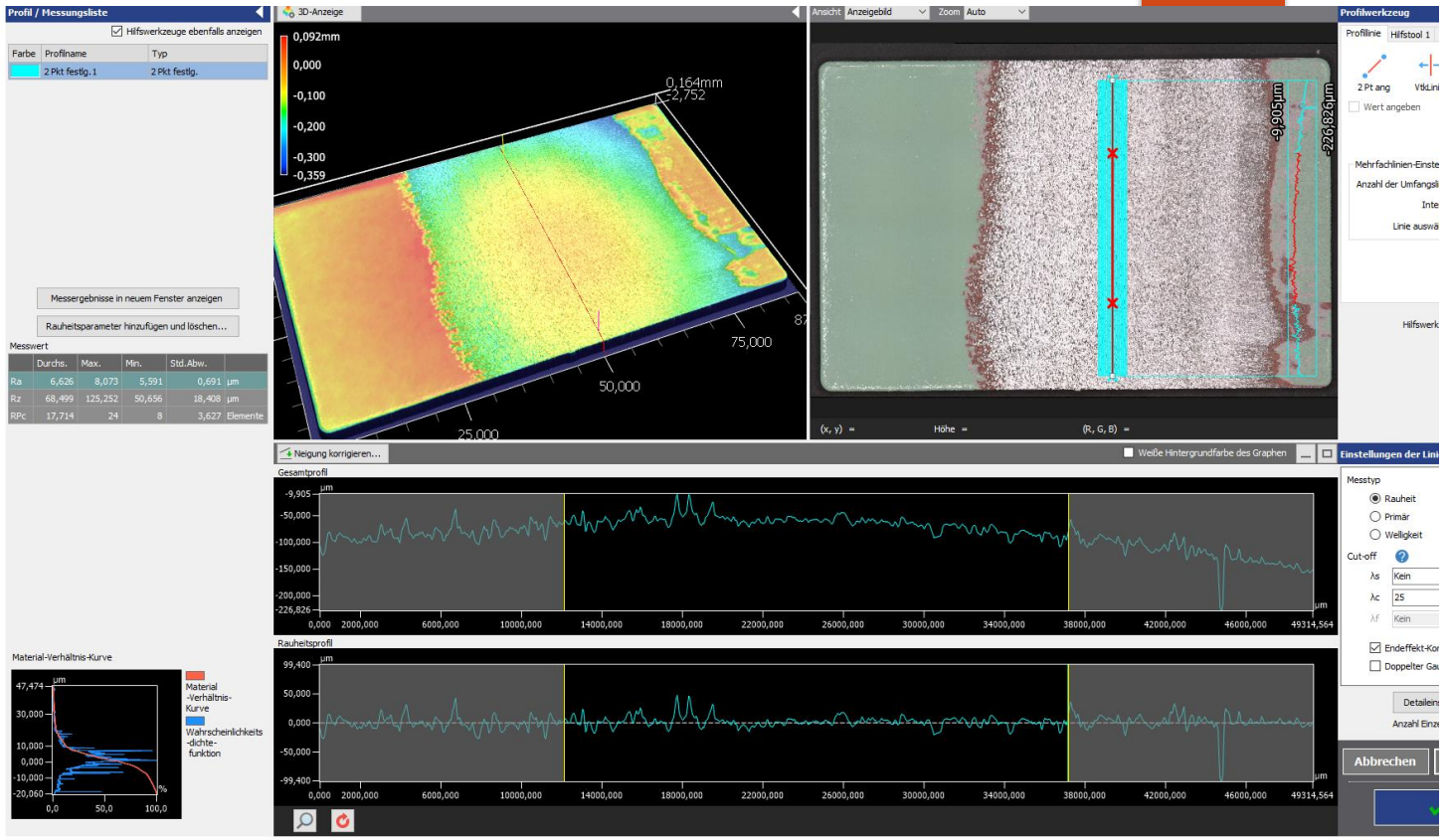
Powertool Bristle Blasting Method





KTA Comparator + Magnified Mobile Phone picture for Bristle blasting…

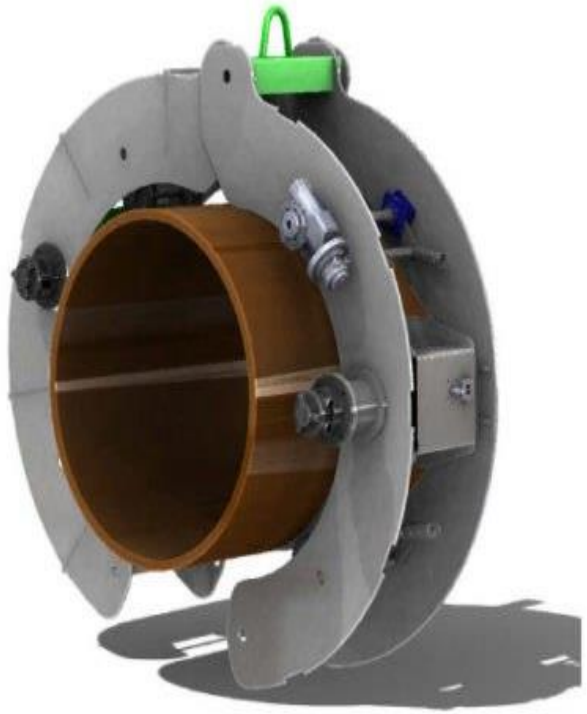




RZ, RPC AND RA PARAMETERS PROFILE

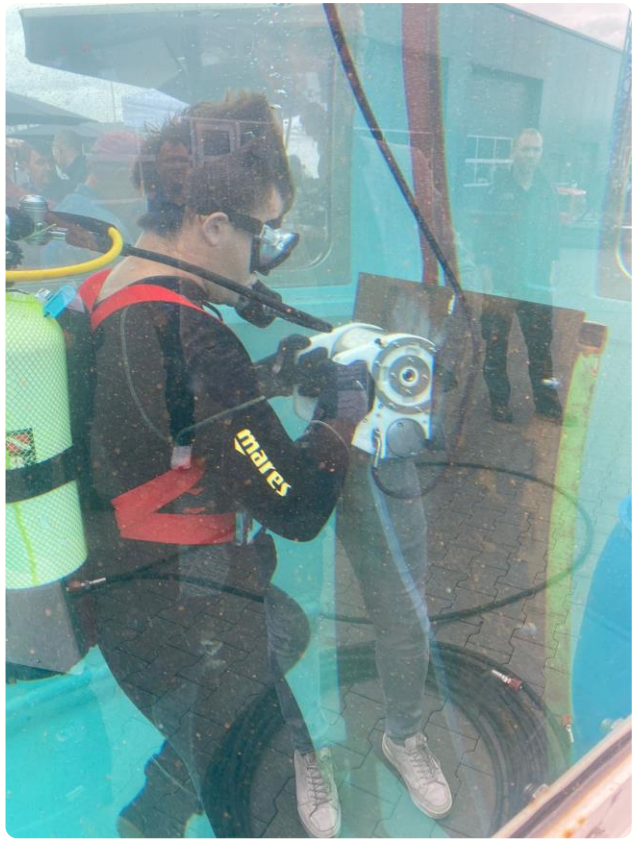
KEYENCE 3D ANALYSIS

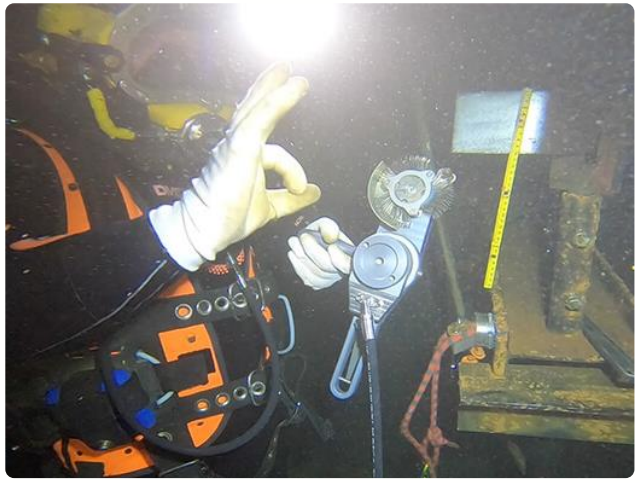
FJC Prepper
Q4 & Q10



Robotic Prepper Q4

AMI Field Joint Coating, London, 2019





Waterdriven Bristle Blaster Subsea

(no hydraulics underwater)

Prepper Q4 Waterdriven Cordless Video


CANUSA-CPS
Corrosion Protection & Sealing
carboline
Coatings - Linings - Fireproofing
STOPAQ
Self Healing Corrosion Prevention
& Sealant Technology
HEMPEL
Estd 1915
JOTUN
HEMPEL
3X
ENGINEERING
SHERWIN WILLIAMS
COVER THE EARTH
International
Covalence
Heat Shrinkable Technology
SEALFORLIFE
BELZONA
Repair • Protect • Improve
PPG
MSP
MATSERVICE PETRÓLEO
PROTEGOL
Coatings
Solution to Success
Sika
DENSO
DEKOTEC
ORIGINAL
kebu
SPC
SPECIALTY POLYMER COATINGS

Our Bristle Blaster® is being applied for field joint coating surface preparation Slovakia to Poland Interconnector pipeline.

The Bristle Blasting technology was preferred to traditional grit blasting due to savings through simple, fast and effective application. The necessary equipme prepared and mobilised in record time despite the challenges of difficult acces such as steep hills and swamps demonstrating clear advantages of the Bristle technology over the heavy grit blasting equipment.

EUSTREAM Interconnector Meeting quote: “Bristle Blasting is a Project LifeSaver”

Importance of Trained Operators

References
Gasunie Netherlands Nitrogen Plant
Open Grid Europe according GW15

Certified Bristle Blasters

Bristle Blaster Double at 3m2/hour

Repeatability and Productivity

Grit Blasting:	
Resource	2 workers
Prep. Works	60 minutes
Working Time	10 minutes
Clean-up Time	60 minutes
Consumables	1. Ground Sheets 2. Grit
Equipment	1. Pot and Gun 2. Machine 3. Tethered Hose 4. Compressor
Environmental	1. Contaminated Waste 2. Noise Levels
Safety	Air-fed PPE
Time	260 minutes (130 x2)

Bristle Blasting:	
Resource	1 worker
Prep. Works	20 minutes
Working Time	20 minutes
Clean-up Time	5 minutes
Consumables	• Ground Sheets
Equipment	• Bristle Blaster
Environmental	No grit required
Safety	Atmosphere Check
Time	45 minutes (45 x1)

Avoid disagreement over quality of prep and pipeline coating

- Cleanliness relates also to NON-visual contamination (dust, salts, chlorides, sulphites) to avoid adhesion loss
- A dense, angular, regular profile (anchor pattern) is required in order to obtain the largest, cleaned surface area and maximum mechanical adhesion of the coating to the cleaned and profiled substrate. A rounded, dished profile is not acceptable.
- For PQT's (Procedure Qualification Trial) new field methods should resemble same or better performance results
- In case of method selection, also look at Operator Safety, Operator Training (certificate), Health (Chromate 6) PPE, Mobilisation and Demob Cost, Recyclability, and Emissions
-

Roadtour telling about Recycling the Belts Program