Enhancement of Weld Seams by Shot Peening at off-shore Constructions

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Shot Peening

A process where small round particles, usually metallic, ceramic, or glass, are impacted against the surface of a metallic part at high enough velocity to cause plastic deformation on the surface. This results in compressive residual stress, strengthening the surface.

https://www.padtinc.com/digital-manufacturing/glossary/shot-peening/

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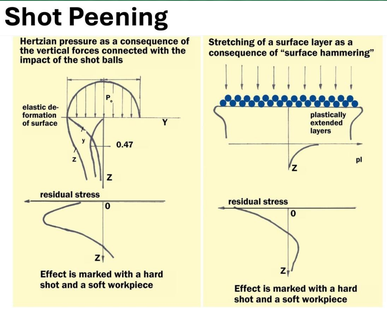
Shot Peening



high tensile strength low tensile strength

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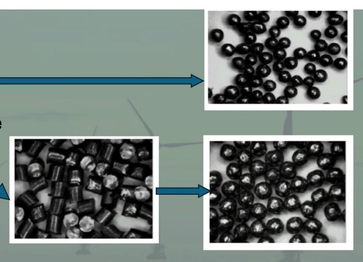
Particles

steel shot
conditioned cut wire
ceramics
glass



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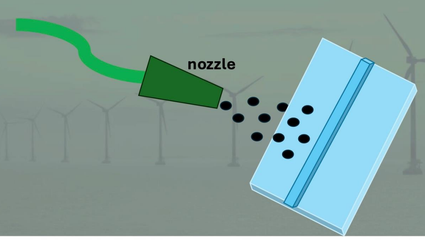
Shot Peening Equipment

Shots accelerated by air pressure.



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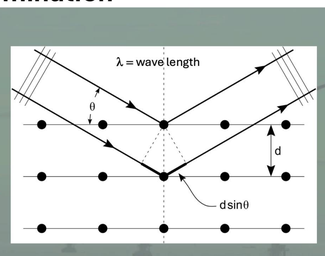
Residual Stress Determination via X-Ray Diffraction

Bragg Reflection

$\lambda = 2\,d \sin\theta$



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Residual Stress Determination via X-Ray Diffraction

Cos-α method

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Samples

Utgrunden Irene

Both samples were more than 20 years under water.

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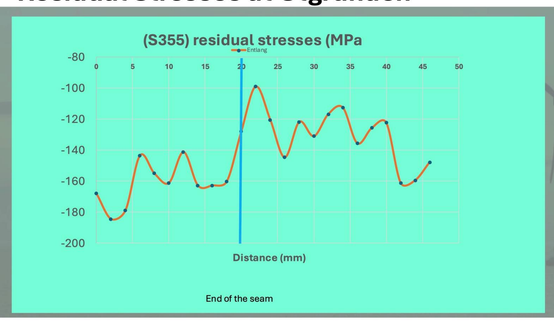
Residual Stresses at Utgrunden



End of the seam

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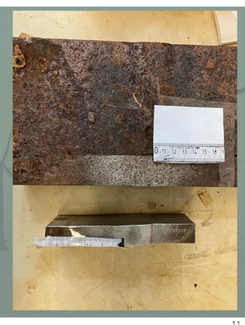
Peening Conditions

conditioned cut wire 0.6 mm diameter

Almen A 0.29 mm



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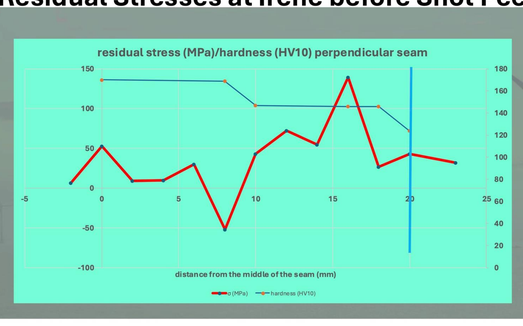
Residual Stresses at Irene before Shot Peening



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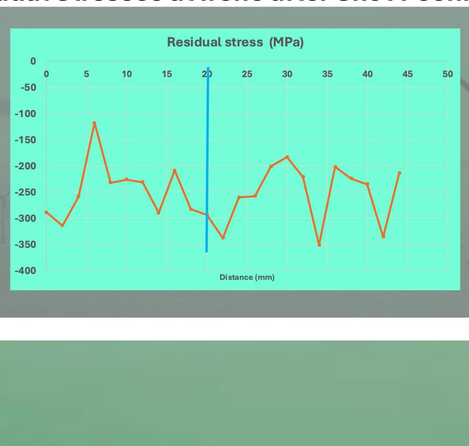
Residual Stresses at Irene after Shot Peening



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Advantages of Shot Peening

- ○ Cleaning the weld seam
- ○ Inducing compressive residual stresses (delay of cracking)
- ○ Hardening the material
- ○ Higher resistance against corrosion
- ○ Better adhension of the coating

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Financial Aspects

Blast Cleaning → Shot Peening

Corundium → Steel Shot

50 kg 60 € → 50 kg 140 €

Same equipment

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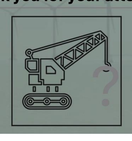
Summary

With small financial efforts shot peening can raise the quality of a weld seam.

Thank you for your attention!



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