RPR TECHNOLOGIES AS

RPR Induction System

"The ultimate solution for coatings removal on steel"

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- Introduction to RPR Technologies
- Principles of RPR Induction Disbonding technology
- RPR machines & components
- Main advantages over conventional removal technologies
- Surface and Disbonding
- Work in hydrocarbon storage tanks
- References
- Sales and Service

Introduction

- Location: Skien, Norway
- Established in 2002
- Patented and proven technology for clean, economical, rapid and safe removal of coatings from steel surfaces
- Unique solutions for coatings removal on ships/marine, buildings, bridges, tanks, oil processing industry, offshore and pipelines
- Global distribution Network

RPR Induction Disbonding

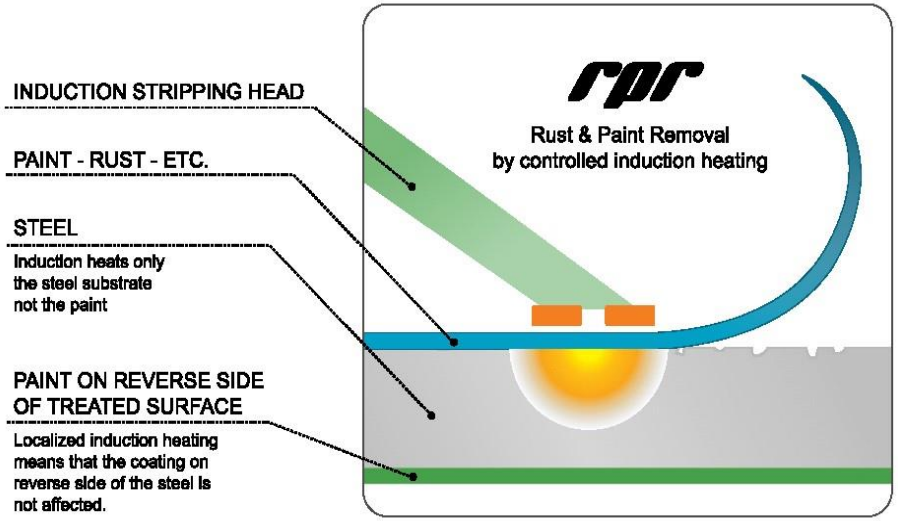
Old technology, New applications

- Induction heating – since early 1940's
  Widely used to harden paint & metal
  (i.e., saw blades, enamel pots, etc.)

- Today used in many households for cooking

- Used by RPR Technologies in a new way:

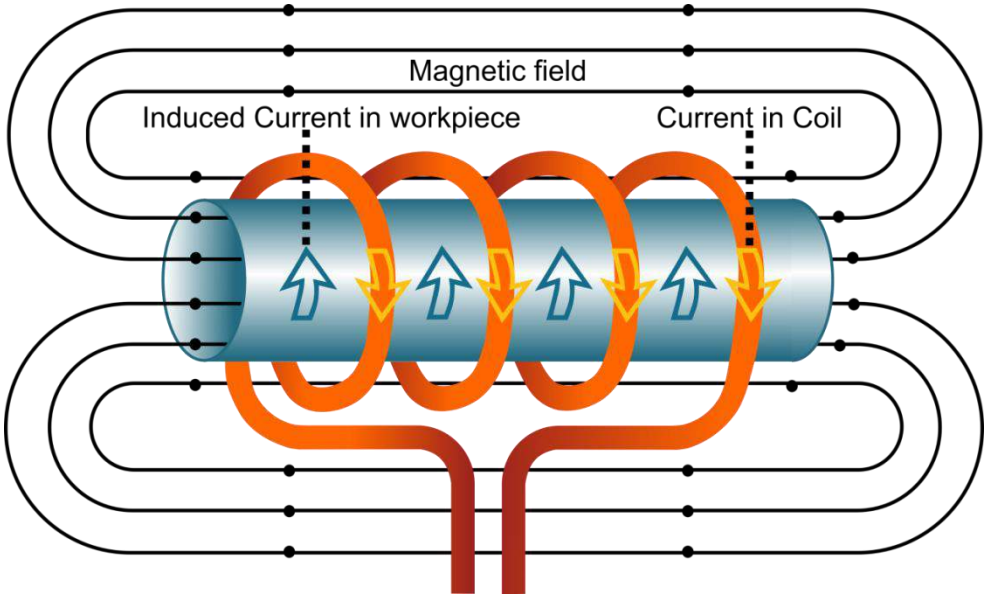
  Coatings and Rust Removal on Steel



The Principle of Induction Heating

The RPR induction generator sends alternating current through an induction coil, which generates an electro-magnetic field. This magnetic field induces eddy currents in a conductive material like steel.

Due to the resistance of the steel, these currents are converted to heat = induction heating. The heat is generated below the coating, resulting in quick and clean disbonding.

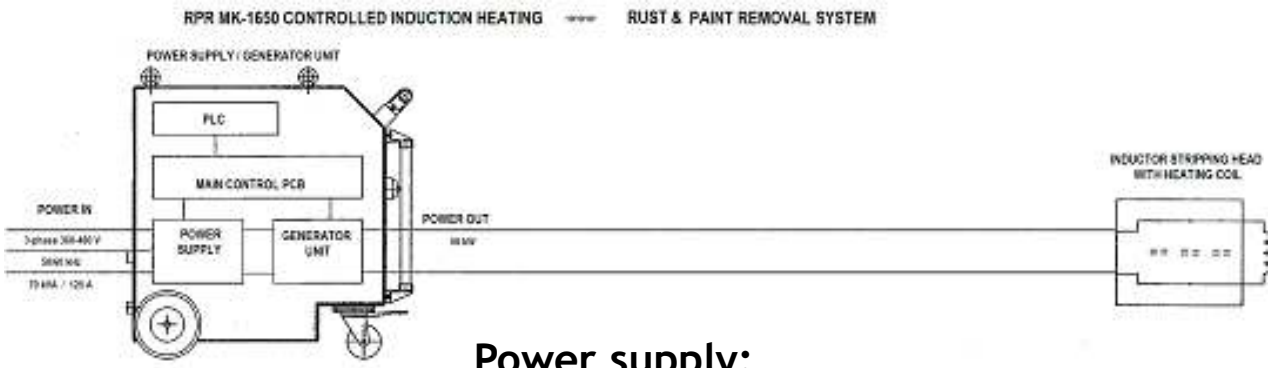


Product Range

Item	1032	1650
Power Supply	40 kVA	70 kVA
Fuse	63 Amp	125 Amp
Max Output	32,5 kW	50 kW
Weight	97 kg	255 kg
Standard cable length	15 & 25 m	20 - 100 m
Inductor heads	10 cm and 90°	Various
Transformers	Light weight	Various
Coating thickness	0 – 10 mm	0 – 30 mm

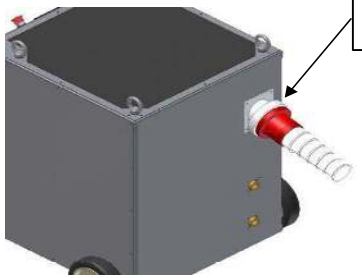
- RPR 1032 is considered as a complimentary alternative to RPR 1650
- RPR 1650 remain the most powerful and flexible solution with longer work radius
- Price of RPR 1032 is approx. 15-20 % lower than RPR 1650
- The initial delivery time of RPR induction machines is 8-10 weeks

RPR 1650
Electrical requirements



Power supply:

- 50 kW, 3-phase 360-500 V, 50/60 Hz
- Power source must be 3-phase, 125 A fused
- In case of using a diesel generator as power source, it needs to have a MPG module installed



EU Standard 5 pins 400/440 V
125 Amp Contact

Each machine comes with a plug that can be attached to customer's own cables.
Note: Cables are not included

RPR 1032
Electrical Requirements

Power supply:

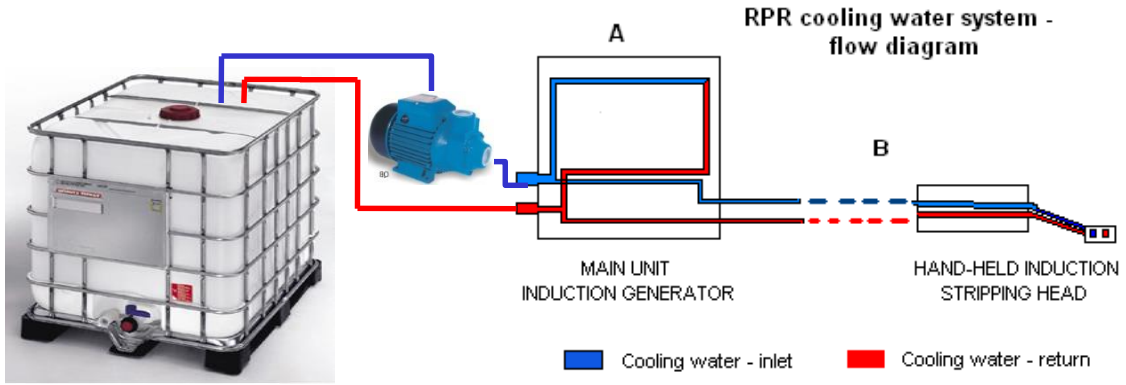
- 40 kVA, 3-phase 360-500 V, 50/60 Hz
- The power source must be 3-phase, 63 Amp fused

The machine is delivered with 5 m power cable and connector of EU standard 5 pins 400 V, 63 Amp

RPR Induction Requirements for water-cooling system

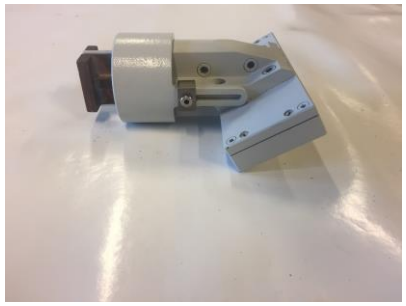
- The system require use of a water circulation pump with a minimum flow rate of 12 l/min potable water and minimum 4 bar pressure
- Maximum operating water temperature is 37° C
- At working heights of 20 m or more above the generator unit, the pressure must be 10 bar
- A water pump with electric motor may be needed to maintain sufficient flow and pressure
- A “closed loop” water tank (for recycling water) with some kind of cooling is recommended

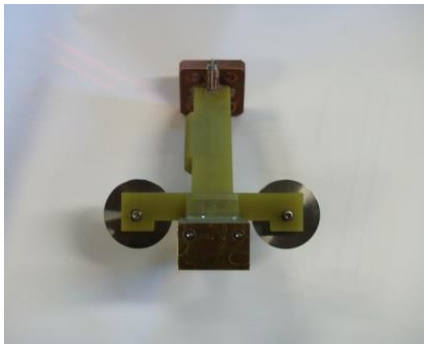
NOTE: THE MACHINE WILL NOT WORK IF THE WATER FLOW IS TOO LOW OR IF THE COOLING WATER TEMPERATURE EXCEEDS 37°C

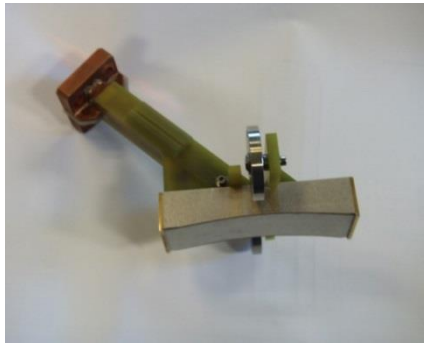


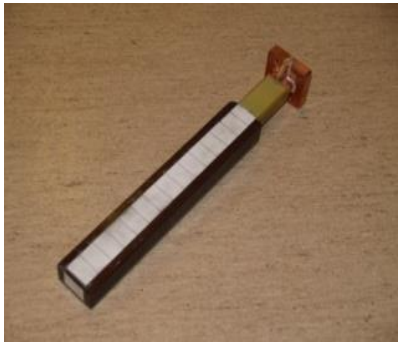
RPR Inductors

Many types, shapes and sizes of inductors are available:









Technical Data - Transformers




Machine	RPR - 1650					RPR - 1032
Transformers	**4:1 XS**	**4:1**	**3:1**	**3:1 XL**	**2:1**	**10:1**
Max Output Voltage	96 V	120 V	160 V	160 V	240 V	60 V
Weight	2,4 Kg	7,1 Kg	8,8 Kg	17 Kg	26 Kg	2,6 kg
Weight Capacitor box	12,0 Kg	12,0 Kg	12,7 Kg	Integrated	Integrated	Integrated
Induction heads Size/Weight	10 cm 1,2 Kg	10 cm: 1,5 Kg 20 cm: 2 Kg	10 cm: 1,5 Kg 20 cm: 2 Kg	10 cm 2,3 Kg	12 cm 2,5 Kg	10 cm 1,3 kg
Typical Coating thickness	0-4 mm	0-6 mm	2-12 mm	3-20 mm	10-35 mm	0-10 mm
Max. Coating thickness	6 mm	13 mm	20 mm	25 mm	40 mm	15 mm
Maximum work radius from the generator	100 m	100 m	60 m	40 m	20 m	35 m

Main advantages by using RPR

- ECONOMIC
- FAST
- SAFE
- SILENT
- CLEAN
- EFFICIENT
- ENVIRONMENTALLY FRIENDLY
- RELIABLE & DURABLE

HSE

- Operator friendly; Quiet and no HAV's
- No use of dangerous high pressure hoses
- Produces no airborne waste particles
- Minimal operator safety equipment or gear required
- No handling or disposal treatment of grit or water
- Minimum waste removal – simple logistics and low costs

Sandblasting

Hydroblasting

RPR Induction

Environmental Benefits

The RPR system produces:

- **No airborne particle waste** that is dangerous to the environment and operators
- **No water waste** or wash-off that can contaminate rivers and sea
- **No grit,** reducing handling and disposal of waste to a minimum
- **No noise**, which can be dangerous for operators, allowing other people to work next to the machine without trouble

This results in lower costs and better cooperation with local health authorities

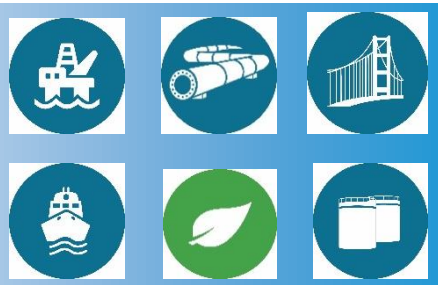
Results of Abrasive Blast Cleaning Ship's Underwater Hull

Conservatively the U.S. Navy performs corrosion control on more than 140.000 m2 of steel for its ships tanks and voids, generating more than **8.000 Mt of mixed abrasive and paint waste**. This waste must be disposed at a cost of nearly **€ 4.3 million annually.**

Substrates and Precautions

- RPR Induction works on carbon steel (magnetic substrates) and some Duplex steel types, depending on the steel properties
- The RPR Induction system requires a minimum steel thickness of 5 mm to avoid damage on the backside coatings or insulation material used
- Thickness and type of coatings as well as type of steel determines the speed of the inductor that is required to obtain disbonding
- In cases when the coating is too thick and the steel is too thin, damage to the backside coating may occur (discoloration/disbonding)

Removal of different paints and coatings



Easy removal

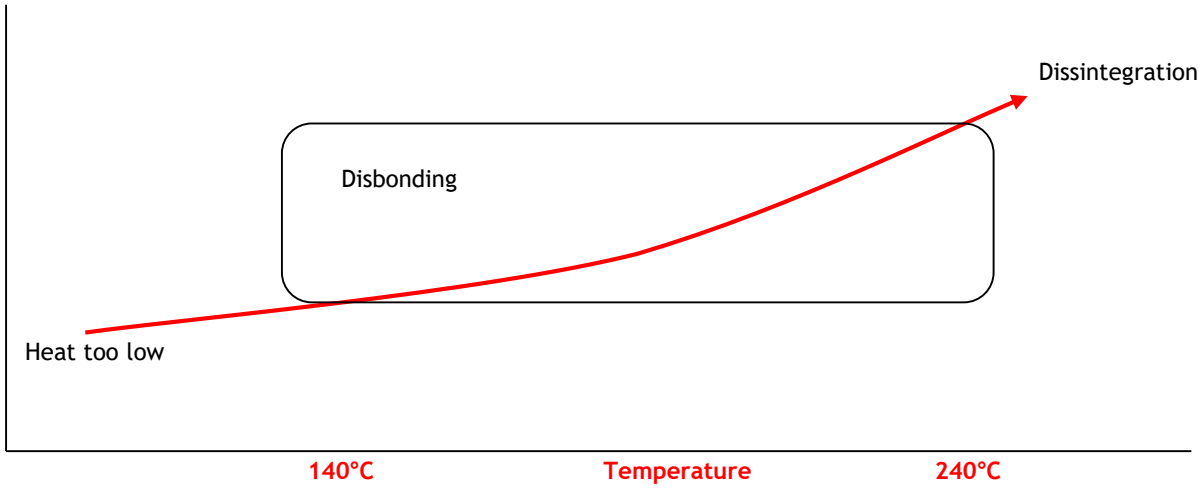
- Most types of standard paints and coatings on steel
- Hard coatings like epoxies, urethanes, old alkyds etc.
- Glass fibre linings
- Fire retardant coatings (PFP's)
- Glued and vulcanized rubber

Difficult removal

- Soft coatings like lanoline
- Bitumen or other asphalt coatings
- Chlorinated rubber
- Zinc silicate and Iron oxide

Coating disbonding

- Disbonding for most coatings takes place with most coatings at temperatures in range of 140 - 240° C
- RPR machine has variable settings for:
  - power / energy
  - operating speed
- Ensures optimum removal efficiency for different coating types with thicknesses up to 25 mm



After-Treatment

- New coatings can often be applied directly over RPR-treated surfaces dependent on specifications from the paint supplier
- Sometimes after-treatment may be necessary to achieve required cleanliness and surface profile
- If after-treatment is required it will be for a quick sweep blast with significant reduction of abrasive consumption + related costs
- Even when after-treatment is required, RPR will be a significantly more cost-effective solution

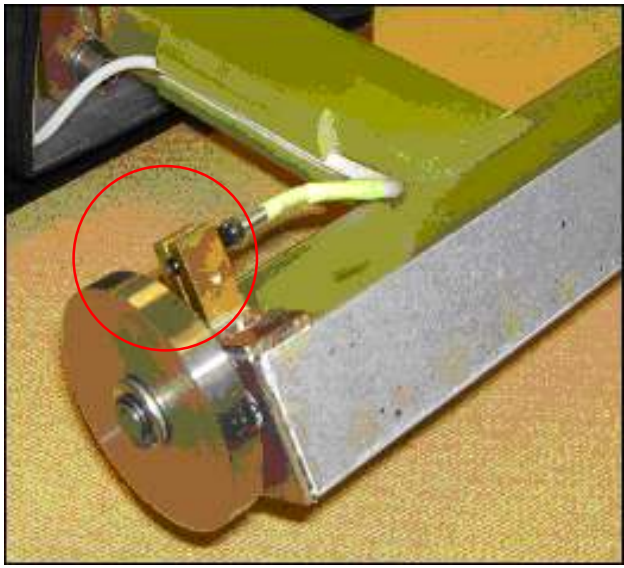
SAFETY FEATURE
Patented Automatic power regulation

- RPR 1650 features an option for automatic power adjustment, protecting the steel against overheating. A fibre-optic sensor monitors the wheel rotation speed and signals from an optic sensor regulates the power supply:

The output power is automatically adjusted relative to the motion speed of the rotating wheel:

- Slower rotation ▶less power
- Faster rotation ▶more power

Allowing to operate with constant surface temperature in accordance with pre-selected settings



Water Cooling & Container Solutions

RPR AX Chiller Series

- Vapor compression type
- Integrated water tank and pump
- Cooling capacity for up to 40-45ºC ambient
- Systems for one or two RPR 1650 units

RPR Container (10ft) Plug-and-Play Solution

- External power connection
- Integrated fuse box
- Ventilation
- Cable package hangers
- Lighting

Applications & Removal Areas

Key Applications

- Oil & Gas
- Pipelines & Pipe Works
- Ships and Marine
- Steel Constructions
- Storage Tanks

Sub-Applications

- Wind Mills
- Mining
- Hydro Power plants and pipelines
- Chemical tanks & pipelines
- PFP – Passive fire protective paints
- Public gas pipelines
- Nuclear Plants
- Sea-lock gates & Surge Barriers
- Harbor piers and jetties

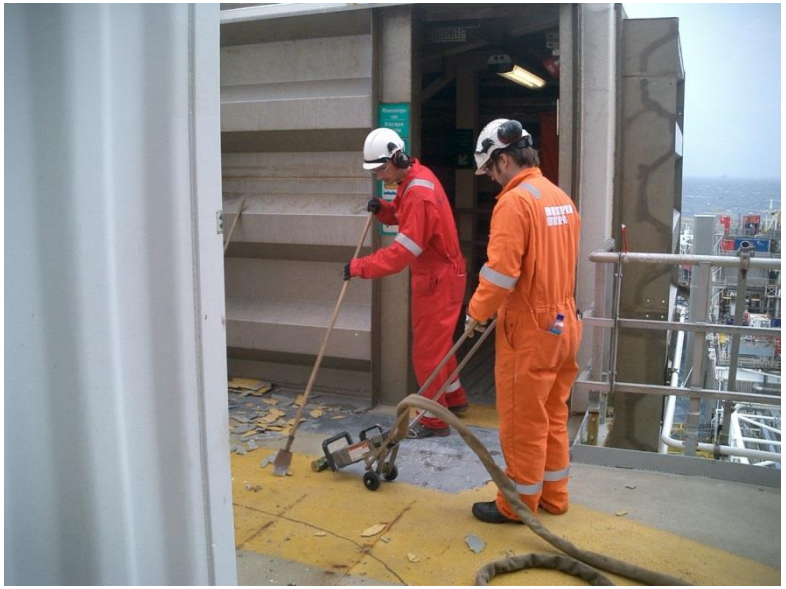
Target Removal Areas - Key Advantages

- Hazardous Coatings
- Rubber Linings
- Intumescent Coatings (PFP)
- Insulation Material (e.g. PU Foam, etc.)
- Thick coatings (2 mm - 25 mm)

Oil & Gas

Typical areas of use:

- Anti-skid (Gangways)
- Living quarters
- Tank linings – water tanks etc.
- Helicopter decks
- Thick protective coatings
- PFP (Passive fire protection)
- - and many more



Main Features:

It removes coatings with thickness up to 20-25 mm, including epoxy, rubber, glass-flakes, etc. Work can be done up to 100 meter from the main generator and during operation, simultaneously with inspection and other maintenance work taking place in the same sector. No grit or water to be transported or disposed off.

Steel Constructions

Typical application areas:

- Removal of coatings with Asbestos Lead or PCB
- Multi-layer coatings
- PFP's
- Epoxies
- Special protective systems
- - and many others

Main Features

It removes coatings with thickness up to 20-25 mm, including epoxy, rubber, glass-flakes, etc. Work can be done on constructions during operation, simultaneously with inspection and other maintenance work taking place in the same sector.

Pipes & Pipelines

Typical application areas:

- Rubber
- Ebonite
- Coaltar
- 3LPE & 3LPP
- PFP (passive fire protection)
- - and many more

Main Features:

It removes hard and soft rubber coatings as well as other thick linings with thickness up to 25 mm at stripping rates up to 20-25 m^2/hour.
The system can be operated both outside and inside of the pipes.
Individual rigs or robotics for semi-automatic removal can be mounted.

Pipelines
- Live

PTT Thailand

- Removal and recoating 116,5 km operative gas pipe
- 6 – 12 mm Coal Tar Enamel with Asbestos mesh
- Start up/duration: June 2015/ 4 years
- Pits: 28 - 30 m length = 4000 pits
- RPR Capacity 6 mm CTE: 5-6 m/hrs per unit (3:1 & 20 cm head, Auto mode)
- Mission completed June 2019: 10 RPR Machines

Ships and Marine

Typical application areas:

- Anti-skid (e.g. on gangways)
- Tank linings
- Thick coatings on ship hulls (ice breakers etc.)
- Ship decks
- Car decks
- PFP (passive fire protection)
- - and many more

Main Features

It removes rubber and coatings with thickness up to 20-25 mm, including epoxy, rubber, glass-flakes, etc. Work can be done even at sea and during operation, simultaneously with inspection and other maintenance work taking place in the same sector.

Hydrocarbon Storage Tanks

Typical application areas

- Thick rubber
- Ebonite
- Fiberglass
- Epoxy systems
- Traditional paint systems
- - and many others

Main Features

It removes coatings with thickness up to 20-25 mm, including epoxy, rubber, glass, etc. Work can be done on tanks simultaneously with inspection and other maintenance work taking place. Removal of disposal is easy and waste handling is reduced to a minimum. No grit or water to be transported or disposed off. Considerable reduction of down-time!

Storage Tanks

- Thick glass-flake epoxy tank linings
- Linings for chemical & water tanks
- Hard and soft Vulcanized rubber
- Epoxies

References

- ASMARTEC (Bilbao) – Chemical tanks, rubber
- AGR Mongstad (Bergen) – Oilfield pipes
- US Navy – Submarines & Air-craft carriers
- Spanish Navy – Ship deck
- French Navy – Ship deck
- Shawcor – Pipe works
- Aker Kværner – Offshore & Onshore
- Muehlhan – Contractor
- Eurotunnel – Train wagons
- Bilfinger – Contractor
- CAPE – Contractor
- Kaefer Energy - Contractor

<u>Oil Exploration & Tank Operators</u>

- SHELL
- PETRONAS
- COSMO OIL
- CONOCO OIL/PHILIPS
- BP
- REPSOL
- PTT
- TOTAL
- PREEM
- PETROBRAS
- STATOIL (EQUINOR)

Sales and Service

- Service, sales and rental is arranged by local distributors or RPR Technologies
- Operator training is mandatory and provided by distributors or RPR Technologies
- A safety stock of spare parts is available for overnight shipment from RPR in Norway
- Supervisor support during commissioning can be offered and agreed upon need

Conclusion

- RPR Induction Disbonding Technology offers:

  - Proven and acknowledged technology throughout the industry
  - Unique, fast and economical disbonding solutions
  - Disposal waste reduced to a minimum
  - Optimal handling of health and safety issues
  - Environmentally friendly coatings removal
  - Safe and Work efficient operation
  - Minimal impacts on other operations
  - Robust mandatory competence system (training at all levels)

RPR Technologies AS

RPR Induction Disbonder System

The unique proven and innovative patented method for coatings removal is available for YOU!

For more information, please visit our Website:
www.rprtech.com