

MetaLine®.com

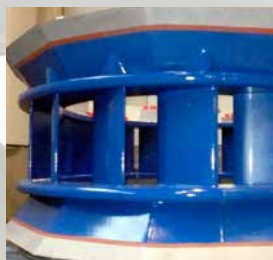
surface protection

Elastomeric repair coatings

Kaplan- & Francis-Turbines, Tidal Turbines, Pumped Storage Plants, Drafttubes, Penstocks, Fittings, Hydraulic Engineering

MetaLine® Series 700

fighting against cavitation, erosion, wear, corrosion & loss of efficiency



Promoted by the leading hydro-turbine manufacturers . . .

Process Description

Changing surfaces to the better ...

**Absorbing destructive energy instead of deflecting it!
Sprayable elastomeric high performance coatings to
solve erosion, cavitation, abrasion and corrosion
problems in hydropower installations**

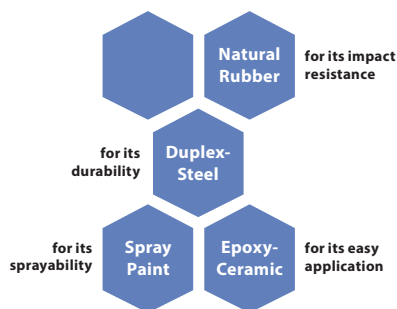
MetaLine® Serie 700 incorporates the primary technical characteristics of completely different materials: The application process is as straightforward as with an epoxy-ceramic repair product. However, the material base is elastomeric and finally possesses erosion resistant qualities equal or **greater than Duplex Steel** . . .

NOT rubber, NOT steel, NOT epoxy and
by far NOT paint – but an ingenious mix
out of all four of them!

MetaLine® Serie 700 extends the service life of metallic substrates by initially storing the destructive kinetic energy (like rubber) and returning it with a time delay - but reduced bounce. The process is based on a duroplastic **polymer design** instead of a traditional vulcanization. No seams, no tension-induced delamination and no massive equipment requirements!

The result is a hydrodynamically resistant protective coating that exhibits unmatched erosion & cavitation resistance. Ceramic composites and conventional protective coatings are FAR inferior in terms of wear resistance and service life!

However, the correct application requires specialist knowledge, experience and precision down to the smallest detail – **MetaLine® Serie 700** is NOT a do-it-yourself solution!



Disappointing repair reality – brushed-on epoxy ceramics. No engineer wants to see such turbulence-generating results anymore. Today, “good” looks completely different ...



... and that's how it should be! The MetaLine® surface regeneration is significantly smoother than casted steel and up to 500 % more wear-resistant. A technology that can really extend the service life of stainless steel ...



And what is the response of the international markets?

To consider MetaLine® not only as a repair solution but more and more as a novel product concept for the engineering design of new equipment as well. Tested & supported by key **OEM manufacturers**, R&D laboratories, research universities & multiple public authorities!

University of London
University of Leoben
University of Tallinn

60 years of experience

In 1960 MetaLine® started its international activities in the field of surface protection and developed itself into the **oldest** German manufacturer of synthetic repair- and coating materials.

Our Series 700 technology has become an OEM standard (Original Equipment Manufacturer) in various industries.



MetaLine® is located near Stuttgart (South-Germany) and by this in the center of the European hydropower industry! Through our certified sales partners we are available in more than 70 countries.

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E-Mail: info@metaline.de

MetaLine® Series 700 is a solvent-free 2-pack elastomer applied through our own **low-pressure** spray process. The solidification starts already after 1 minute, so that extremely smooth film thicknesses starting from 1 mm (40 mils) can be realized without any sagging on vertical surfaces or overhead.

MetaLine® Series 700 adheres to most substrates including steel, stainless steel, brass, aluminum, bronze or concrete. No heating of the component is required. The coating is dry to touch after approx. 5 minutes. Return to service can take place after 48 hours (at 20 °C / 70 °F) at the earliest.

MetaLine® Series 700 polymerizes without any tension. In addition to its chemical bonding process, a mechanical **memory effect** is developed. This permanently ties the coating to the substrate, thus counteracting any separation tendency that is normally associated with conventional rubber. MetaLine® Series 700 can be recoated and repaired at anytime!

MetaLine Series 700 is supplied in 3 different degrees of rubber hardness

- **MetaLine® 760 (60 Shore A)** for the repair of existing rubber linings
- **MetaLine® 785 (85 Shore A)** for the coating of erosion and cavitation impacted components
- **MetaLine® 795 (95 Shore A)** if hydrophobic properties are required to increase the flow speed

MetaLine® Series 700 coatings are **non-toxic** and safe to use.

The strength of MetaLine® Series 700 lies in its erosion and wear resistance, which is comparable to high-alloy steels and armors. In particular, "glacial abrasion" caused by high sediment content can be significantly minimized.

With a density of just 1.05 g/cm³ (0.038 lb/in³), MetaLine® represents the **most lightweight duroplastic wear protection concept**. The weight-related advantages (e.g. vibration) compared to heavy metallic armor or welding overlay are considerable.

The 3 major European hydroturbine manufacturers have standardized our process and offer it as an OEM "Soft-Turbine-Coating" solution to their customers!

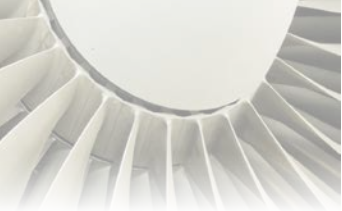


MetaLine® APPLICATOR S-700 and Series 700 double cartridges – because spraying simply gets smoother & better!

Experts talk about limits:

- 1 Professional **surface preparation** is mandatory! The substrates to be coated must be dry, clean, free of oil, desalted and gritblasted to a **specification** of R(t) = minimum 125 my (5 mil)
- 2 For a proper processing, surface temperatures of at least +15 °C (+60 °F) are absolutely mandatory
- 3 The application is possible in fresh water as well as in **salt water**
- 4 The use on Pelton runners is excluded due to the high pressure. Furthermore **drop heights** of more than 150 meters (500 ft) and flow velocities of more than 50 m/s (165 f/s) shall be avoided
- 5 Within the coating area no **solid anodes** are advisable and are not permitted
- 6 The average coating thickness must be at least 2.5 mm (100 mils) in the most impacted zones. Partial coatings must be kept to a minimum in order to minimize the formation of elastomeric edges
- 7 Elastic turbine coatings basically require a functioning **debris filtration**. Unprotected operation is absolutely not recommended





Turbine Casing / Spirals

MetaLine® Series 700 – Effective wear protection for hydropower plants

Whether small or large – wear problems in hydro-water installations are considerable. Sprayable, elastomeric coatings are a solution: Impact-absorption instead of energy-deflection. Repairable or partially recoatable in situ.

Applications

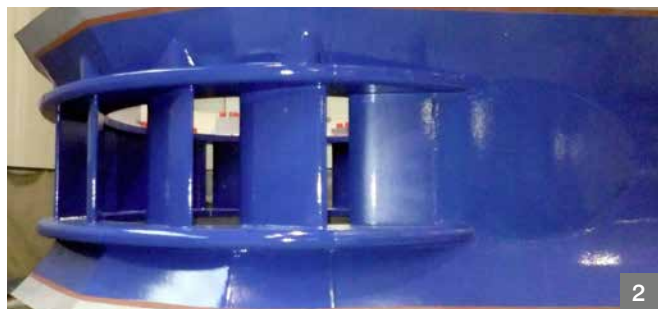
- stay vanes / guide vanes
- spiral cases
- head covers
- stay rings
- draft tubes
- pelton nozzle heads



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Reference

- rubber-like, homogeneous spray solutions for complex geometries
- impact-resistant and extremely energy-absorbing when exposed to crashing particles
- as a tension-free alternative to thermal welding & plasma armoring processes



7

Kaplan Runners

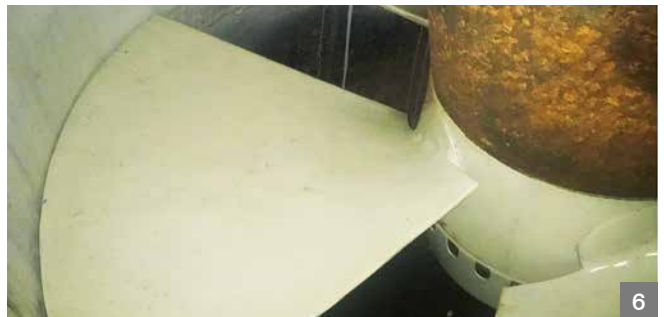
MetalLine® Series 700 – Effective wear protection for hydropower plants



Synthetic elastomers for the seamless protection of highly abused structures. Precise in its thickness preserving the original contour. Smooth surface features creating a fluid-flow-optimized performance. Effective & cost-optimized.

Applications

- kaplan impellers
- guide vanes / equipment
- pipe turbines (horizontal / vertical)



Reference

- extremely high adhesion / bond strength of up to 15 N/mm²
- up to 25 % higher erosion resistance than AISI 316 (salt water resistant stainless steel)
- can be repaired ON-SITE and partially overcoated at any time



Francis Runners

MetaLine® Series 700 – Effective wear protection for hydropower plants

There is hardly no more difficult geometry for coatings – and yet a success story for MetaLine® elastomers in the last 20 years: Unrivalled in terms of cavitation protection!

Vibration and impact resistant. Basis weight only approx. 1.05 kg/m² (0.21 lbs/ft²) per mm (40 mils) coating thickness.

Applications

- francis impellers / runners
- free flow turbines
- guide vanes / -apparatus
- flow straighteners
- fittings



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Reference

- tested to be up to be 50 times more erosion resistant than leading epoxy-ceramic brands
- hydrodynamically optimized, extremely smooth surface structure minimizing turbulences
- hydraulically and pneumatically pressure resistant up to 70 bars (1015 psi)



7

Filters / Water-Management

MetaLine® Series 700 – Effective wear protection for hydropower plants

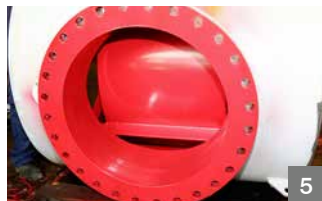
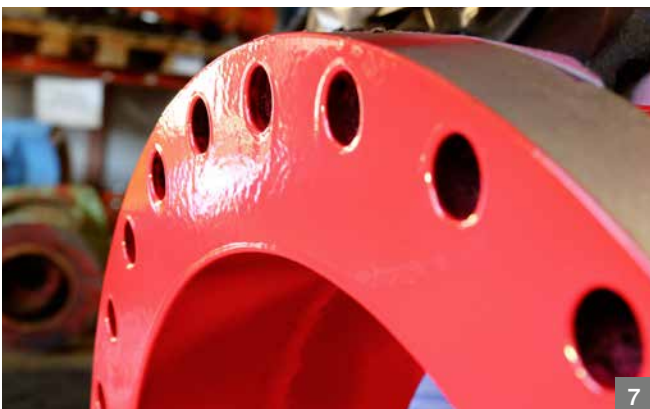


MetaLine® 785 – a polymeric, rubber-like protective skin for corrosive and mechanically highly stressed metal structures.

Withstands impacting forces and local pressure peaks. A seamless, multi-layer matrix that provides reliable and durable protection for filter systems.

Applications

- screening inserts
- steel & stainless steel filter bodies
- flanges



Reference

- active (encapsulating) and passive (anodic) duplex corrosion protection properties
- vibration-resistant with a specific density of only 1.05 g/cm³ (0.038 lb/in³)
- standardized by various manufacturers in accordance with their OEM specifications

Pressure Pipes

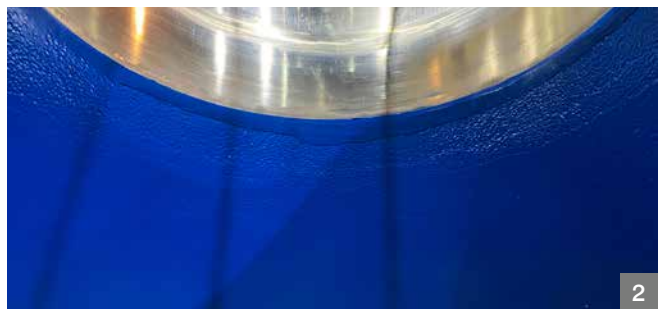
MetaLine® Series 700 – Effective wear protection for hydropower plants

Fluid flow installations to and after the turbine runner are partially exposed to considerable stress due to turbulence, cavitation or solids impacting. MetaLine® coatings “armor” these areas softly against alternating loads.

More efficient than any paint system, more resistant than steel, more economical than epoxy ceramic composites.

Applications

- pressure pipes
- suction pipes
- draft tubes
- penstocks
- pipe bends / hollow jet valves



Reference

- visual wear control through color change within the coating build-up
- electrical insulating properties prevent galvanic corrosion and pitting corrosion
- can be locally reinforced with metal mesh or textile fabric

Valves / Fittings

MetalLine® Series 700 – Effective wear protection for hydropower plants



1

Sprayable elastomeric coatings for interior and exterior protection against (salt water) corrosion. Chemically resistant in a pH range of 3-11. Optionally available with anti-stick properties. Disposable in different color shades.

Applications

- butterfly valves
- stop valves
- compensators
- spigots
- throttle valves
- bellows
- fireplugs
- fire-extinguishing water supply pipes



2

MADE
IN
GERMANY
60 YEARS OF
EXPERIENCE



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7

Reference

- adheres to (stainless) steels & metals, including brass, aluminum, copper . . .
- smooth surface structure to protect against flow disturbances and cavitations
- up to 550 % longer service life compared to cast iron or mild steel housings



Ball Valves

MetaLine® Series 700 – Effective wear protection for hydropower plants

The cast of large ball valves for a Saudi Arabian water pipeline showed leaks and threatened to cause construction delays on-site. Re-manufacturing would have taken months. Sealing attempts with epoxy ceramics failed due to cracking in the coating at a test pressure of 150 bar (2,175 psi).

MetaLine® employees were able to solve the problem on site with a 2 to 5 mm (80 to 200 mils) thick elastomeric coating in a prompt & professional manner.

Applications

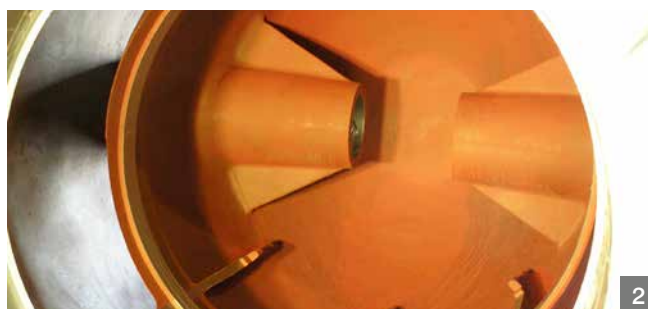
- ball valves



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Reference

- suitable for liquid flow speeds of up to 50 m/s (165 ft/s)
- completely shrink- & swell-free during solidification
- multi-stage layer design to reduce interfacial and galvanic corrosion



7

Hydraulic Steelworks

MetaLine® Series 700 – Effective wear protection for hydropower plants



MetaLine® is a state of the art technology to increase service life in hydraulic steelworks. It sets benchmarks when it comes to resistance and durability. A seamless, rubberlike, long-term protection against colliding flotsam, ice floes or other climatic influences.

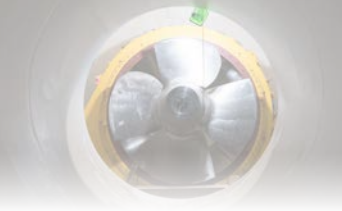
Applications

- water vanes
- weirs
- wicket gates
- floodgates
- bulkheads
- sluices
- piling



Reference

- weather resistant, non-chipping/peeling material properties
- **overhead** sprayability without thickness limitations (pic. 7)
- applicable by different tools including trowel or low & high pressure spray equipment



Immersed Steel Constructions

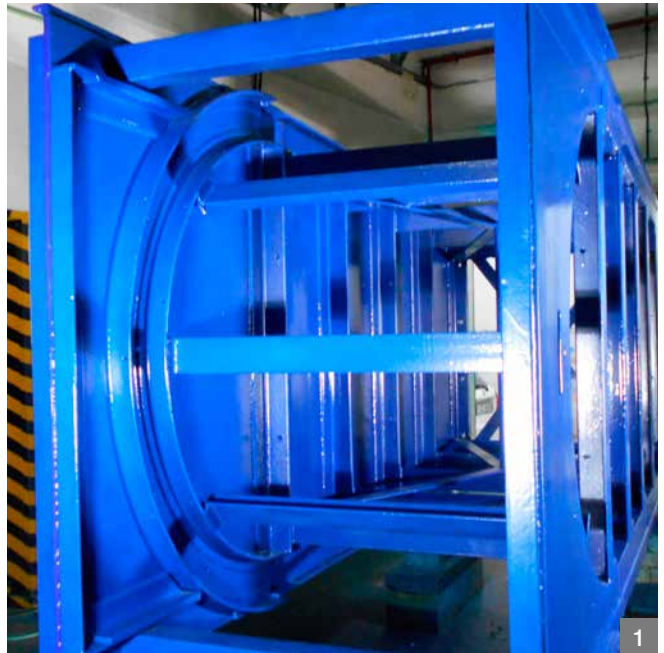
MetaLine® Series 700 – Effective wear protection for hydropower plants

Immersed steel constructions are exposed to the highest corrosive load, especially in the transition area (splash water zone). Solar radiation, surge and marine growth intensify chemical and mechanical attacks.

MetaLine® Series 700 offers long-term corrosion protection in connection with unique elastomeric impact protection properties.

Applications

- pontoons
- docks
- lifting devices



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Reference

- very low static coefficient of friction with $\mu(0) = 0.15$ (similar to PTFE)
- applicable on components which are exposed to very high bending forces
- processable under tropical humidity of up to 100 % and high air temperature



7

Pipes (External Coating)

MetalLine® Series 700 – Effective wear protection for hydropower plants



Sprayable, elastomeric coatings for the initial coating or repair treatment of buried piping. The durable corrosion and weathering protection, especially for on-site application to cover welding seams.

Salt water resistant, root resistant and thermally insulating.

Applications

- liquid-carrying pipes
- solids-carrying pipes
- gas-carrying pipes



Reference

- protection concept for the flanges and internal piping without a seam
- electrically non-conductive (anti-static version $< 1 \times 10^9$ Ohm available on request)
- high flexibility of approximately 380 % to resist vibration of the substrate



Pipes (Internal Coating)

MetaLine® Series 700 – Effective wear protection for hydropower plants

Sprayable, elastomeric wear protection for the long-term protection of debris containing piping. Seamlessly applicable, impact-resistant, electrically insulating. Extremely resistant against fine particle erosion and structural loss of material.

Applications

- pipe bends
- piping (non-stick properties)
- tips
- y-pieces
- dampers
- sluice gates
- pressure pipes



Reference

- resistant to salt water and many chemicals in a pH range from 3 to 11
- free of any metal impurities and therefore absolutely neutral regarding corrosion
- DIN 53516 dynamic abrasion index > 55 mm³ (0.003 in³) (rubber > 120 mm³ / 0.007 in³)





Technical Data

MetaLine® Series 700 – ultra dynamic responding spray-applied elastomers

	MetaLine® 760	MetaLine® 785	MetaLine® 795
Preferred usage (multi-purpose use is possible)	shock absorption rubber repairs noise deadening slip resistance	wear protection erosion protection cavitation protection electrical insulation	fouling release non-stick character corrosion protection fluid flow efficiency increase
Processing spraying / casting / injecting	APPLICATOR S-700 high pressure / low pressure	APPLICATOR S-700 high pressure / low pressure	APPLICATOR S-700 high pressure / low pressure
Solids content DIN EN ISO 3251	100 % by weight / volume no solvent / zero VOC	100 % by weight / volume no solvent / zero VOC	100 % by weight / volume no solvent / zero VOC
Mixing ratio cartridge based application process	2 : 1 by volume	2 : 1 by volume	2 : 1 by volume
Consumption theoretically per mm (40 mils) film thickness	1.25 kg/m ² 0.25 lbs/ft ²	1.20 kg/m ² 0.24 lbs/ft ²	1.20 kg/m ² 0.24 lbs/ft ²
Processing time at 60 °C (140 °F) material temperature	7 minutes	1 minute	1 minute
Solidification at 20 °C (68 °F) – dependent on stress	> 1.5 days	> 1 day	> 1 day
Hardness A.S.T.M. D2240-68	60 Shore A sprayed 65 Shore A casted	82 Shore A sprayed 85 Shore A casted	95 Shore A sprayed 98 Shore A casted
Density DIN EN ISO 1183-2	1.10 g/cm ³ 0.039 lb/in ³	1.05 g/cm ³ 0.038 lb/in ³	1.05 g/cm ³ 0.038 lb/in ³
Pull-off adhesion strength A.S.T.M. D4541	> 15 N/mm ² (Steel S235JR) > 2,175 psi (Steel ASTM A36)	> 15 N/mm ² (Steel S235JR) > 2,175 psi (Steel ASTM A36)	> 15 N/mm ² (Steel S235JR) > 2,175 psi (Steel ASTM A36)
Tensile strength A.S.T.M. D412-16	20 N/mm ² 2,900 psi	20 N/mm ² 2,900 psi	24 N/mm ² 3,480 psi
Tensile modulus at 100 % elongation A.S.T.M. D412-16	6 N/mm ² 870 psi	7 N/mm ² 1,015 psi	13 N/mm ² 1,885 psi
Tear resistance DIN 53 515	68 N/mm 388 pound/inch	55 N/mm 314 pound/inch	68 N/mm 388 pound/inch
Elongation at break A.S.T.M. D412-16	650 %	380 %	275 %
Bashore resilience DIN 53 512	63 %	45 %	27 %
Coefficient of thermal conductivity ISO 8302	0.2 W/K · m 0.11 BTU/h · ft · °F	0.2 W/K · m 0.11 BTU/h · ft · °F	0.2 W/K · m 0.11 BTU/h · ft · °F
Dielectric surface resistivity DIN EN 62631	> 7 x 10 ¹⁰ Ohm	> 7 x 10 ¹⁰ Ohm	> 7 x 10 ¹⁰ Ohm
Dielectric breakdown voltage DIN EN 60243	> 5,000 Volts/mm	> 5,000 Volts/mm	> 5,000 Volts/mm
High temperature resistance above water / under water	+ 100 °C / 212 °F dry + 60 °C / 140 °F wet	+ 120 °C / 248 °F dry + 60 °C / 140 °F wet	+ 120 °C / 248 °F dry + 60 °C / 140 °F wet
Low temperature resistance dry	- 50 °C - 58 °F	- 50 °C - 58 °F	- 50 °C - 58 °F
Linear abrasion (Taber®) A.S.T.M. D4060, H-22, dry, 1 kg, 1,000 revolutions	n.a. n.a.	8.2 mg 0.12 grain	10.5 mg 0.16 grain
Dynamic abrasion DIN ISO 4649	85 mm ³ 0.005 in ³	55 mm ³ 0.003 in ³	65 mm ³ 0.004 in ³
Coefficient of static friction DIN EN ISO 8295	μ(0) = approx. 0.7	μ(0) = approx. 0.6	μ(0) = approx. 0.15
Approvals (dry) pharma & food conformity	FDA 177.1680 (21) EU 1935/2004	FDA 177.1680 (21) EU 1935/2004	FDA 177.1680 (21) EU 1935/2004
Approvals (wet) drinking (potable) water conformity		BS 6920 Part 2.6 AS/NZS 4020:2005	
Purity formulation being free off	no free isocyanate no polyurea, no silicone	no free isocyanate no polyurea, no silicone	no free isocyanate no polyurea, no silicone

MetaLine®.com

surface protection

cavitation inhibiting
vibration dampening
slip enhancing
erosion reducing
impact absorbing
efficiency increasing
electrochemical neutral



You will find MetaLine products being used
in various industries such as:

- | | |
|----------------------------|----------------------------|
| ■ Aeronautical Engineering | ■ Nautical |
| ■ Automation Technology | ■ Occupational Safety |
| ■ Automotive Manufacturing | ■ Offshore & Marine |
| ■ Ceramics Industry | ■ Packaging Technology |
| ■ Chemical Industry | ■ Petro-Chemical |
| ■ Concrete Production | ■ Pharmaceuticals |
| ■ Conveyor Technology | ■ Plastics Processing |
| ■ Electrical Engineering | ■ Power Plant Technology |
| ■ Fertilizer Production | ■ Pulp & Paper |
| ■ Foodstuff Processing | ■ Recycling Technology |
| ■ Glass Processing | ■ Surface Technology |
| ■ Metal Foundries | ■ Textile Machinery Design |
| ■ Mining Technology | |
| ■ Municipal Technology | |
- ... and many more

Simply trust MetaLine's "Engineering made in Germany"!

protect

repair

save

cover

improve

K-700 Hydropower (EN), May 2023

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