

REINHOLD ENVIRONMENTAL[®]



2026 Reinhold/PCUG Round Table Presentation

Hosted by TVA, Southern Company and Vistra
in the Sonesta Nashville Airport Hotel, Nashville, TN
on June 22-23, 2026

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The background image shows a large industrial facility, likely a power plant, with several large blue pumps mounted on concrete bases. These pumps are connected to a network of white pipes and metal structures. The scene is dimly lit, with some light reflecting off the metallic surfaces. The pumps have a robust, industrial design with various flanges and connections.

Quality through experience
since 1938

Extending Asset Life in
Wet FGD Scrubber Systems Through
Advanced Composite Materials



Josh Vines, PMP
Sales Manager – North America

Duechting Pumps North America, LP

Company Profile

- Manufacturing and HQ based in Witten, Germany
- Approx. 150 employees globally
- Family owned – 3rd Generation



Current issue date: 1 February 2022
 expiry date: 31 January 2025
 Certificate identity number: 10424010

Original approval: ISO 9001 - 3 February 1995

Certificate of Approval

This is to certify that the Management System of:

DÜCHTING PUMPEN
Maschinenfabrik GmbH & Co KG

Wilhelm-Düchting-Str. 22, 58453 Witten, Germany

has been approved by LRQA to the following standards:

ISO 9001:2015

Approval number(s): ISO 9001 – 0018248

The scope of this approval is applicable to:

Design and manufacture of single- and multistage centrifugal pumps of metallic and non-metallic materials.

Paul Graaf

Area Operations Manager, Europe

Issued by: Lloyd's Register Deutschland GmbH
 for and on behalf of: LRQA Limited



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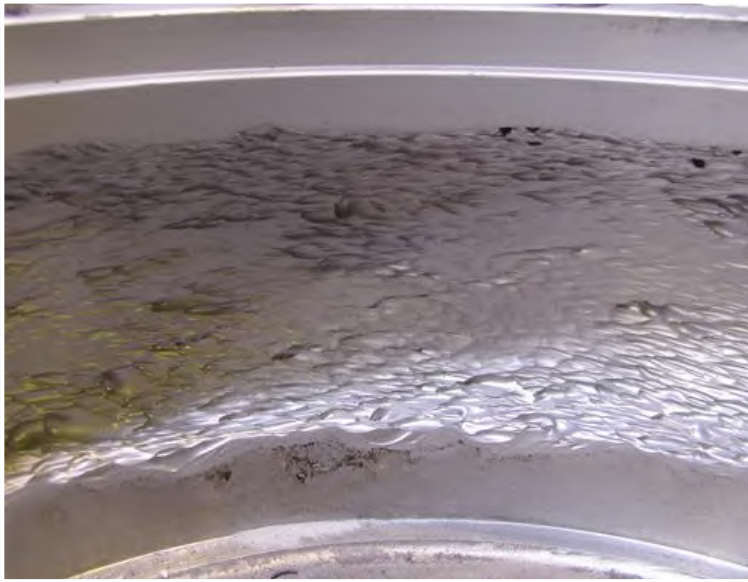
ISO 9001:2015 – since 1995

Duechting's History in FGD Systems

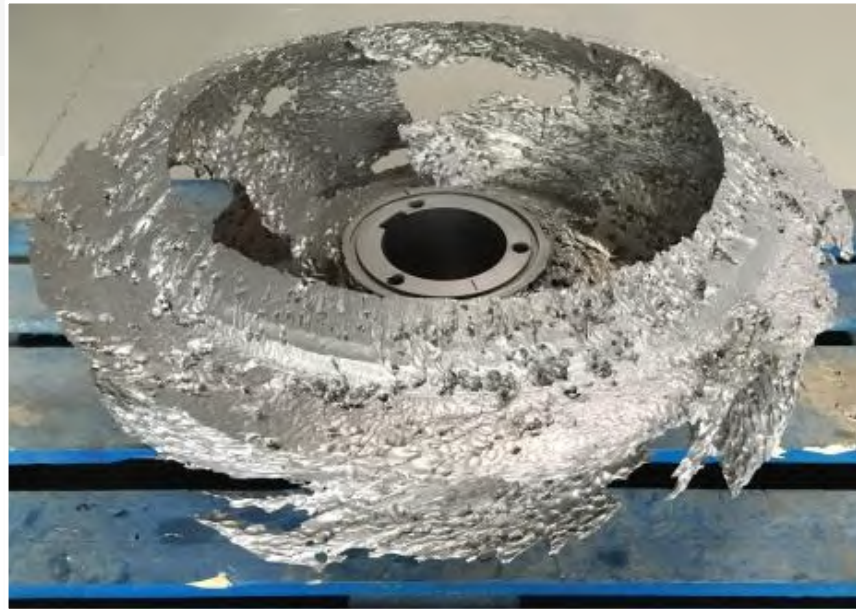
- **Founded in 1938**
 - Pump Repair facility for the German Coal Mining Industry
- **1942:**
 - 1st Düchting HP Mine Dewatering Pump Developed and Produced
- **1958:**
 - DÜCHTING PUMPEN becomes industry standard for pump longevity and reliable operation
 - Main areas: underground mine dewatering & slurry transportation
- **1972:**
 - New factory was built to begin supporting FGD
- **1980's:**
 - DÜCHTING begins producing pumps for FGD-systems
 - Pumps constructed of Duplex Stainless Steel
- **1994:**
 - Mineral cast material (SiCcast) was developed and used for the construction of FGD slurry pumps instead of Duplex Stainless Steel
- **1996: SiCcast Company Founded**
 - Additional expansion to factory to facility SiCcast foundry and machinery
- **2008:**
 - Performance test field, painting facility and export hall



Erosion-Corrosion of Metallic Alloys



*Duplex Stainless Steels
High Chrome Iron
Titanium
Hastelloy*



Erosion-Corrosion of High Chrome

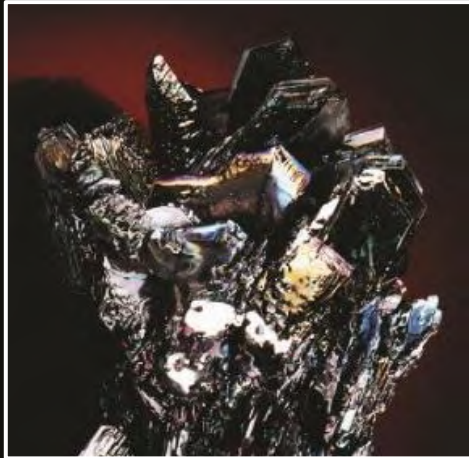


WET FGD MATERIAL SELECTION MATRIX

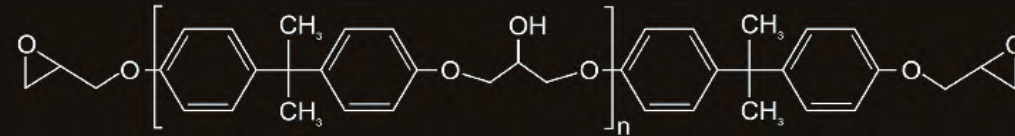
Relative Performance of Common Materials in Wet FGD Service

MATERIAL	RUBBER LINING	DUPLEX SS (2205)	HIGH CHROME IRON (27–38% Cr)	HASTELLOY C-276	SICCAST COMPOSITE
 CORROSION RESISTANCE	Good ★★★★☆	Good ★★★★☆	Fair ★★★☆☆	Excellent ★★★★★	Excellent ★★★★★
 ABRASION RESISTANCE	Good ★★★★☆	Poor ★☆☆☆☆	Very Good ★★★★★	Poor ★☆☆☆☆	Excellent ★★★★★
 EROSION-CORROSION RESISTANCE	Fair ★★☆☆☆	Poor–Fair ★★☆☆☆	Good ★★★★☆	Fair ★★☆☆☆	Excellent ★★★★★
 TYPICAL CHLORIDE TOLERANCE (ppm Cl ⁻)	< 5,000	10,000 – 20,000	15,000 – 30,000*	> 100,000	Not Chloride Sensitive
 TYPICAL pH TOLERANCE	4 – 12	2 – 10	3 – 10	0 – 14	0 – 14
 TYPICAL FAILURE MODE	Abrasion wear, tearing, delamination	Chloride pitting, crevice corrosion, accelerated erosion	Corrosion-assisted wear, localized attack, gradual wall loss	Abrasive wear, erosion of exposed surfaces	Gradual wear at highest velocity zones

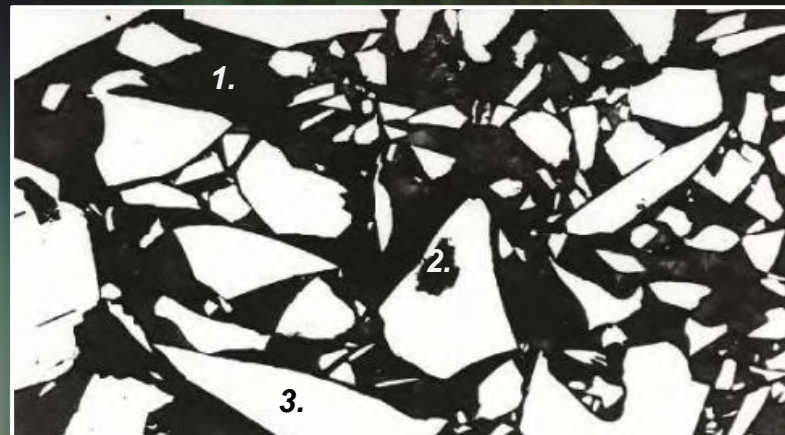
* Highly dependent on slurry chemistry, oxidation level, chloride concentration, and solids loading.



Silicon carbide



Epoxy resin



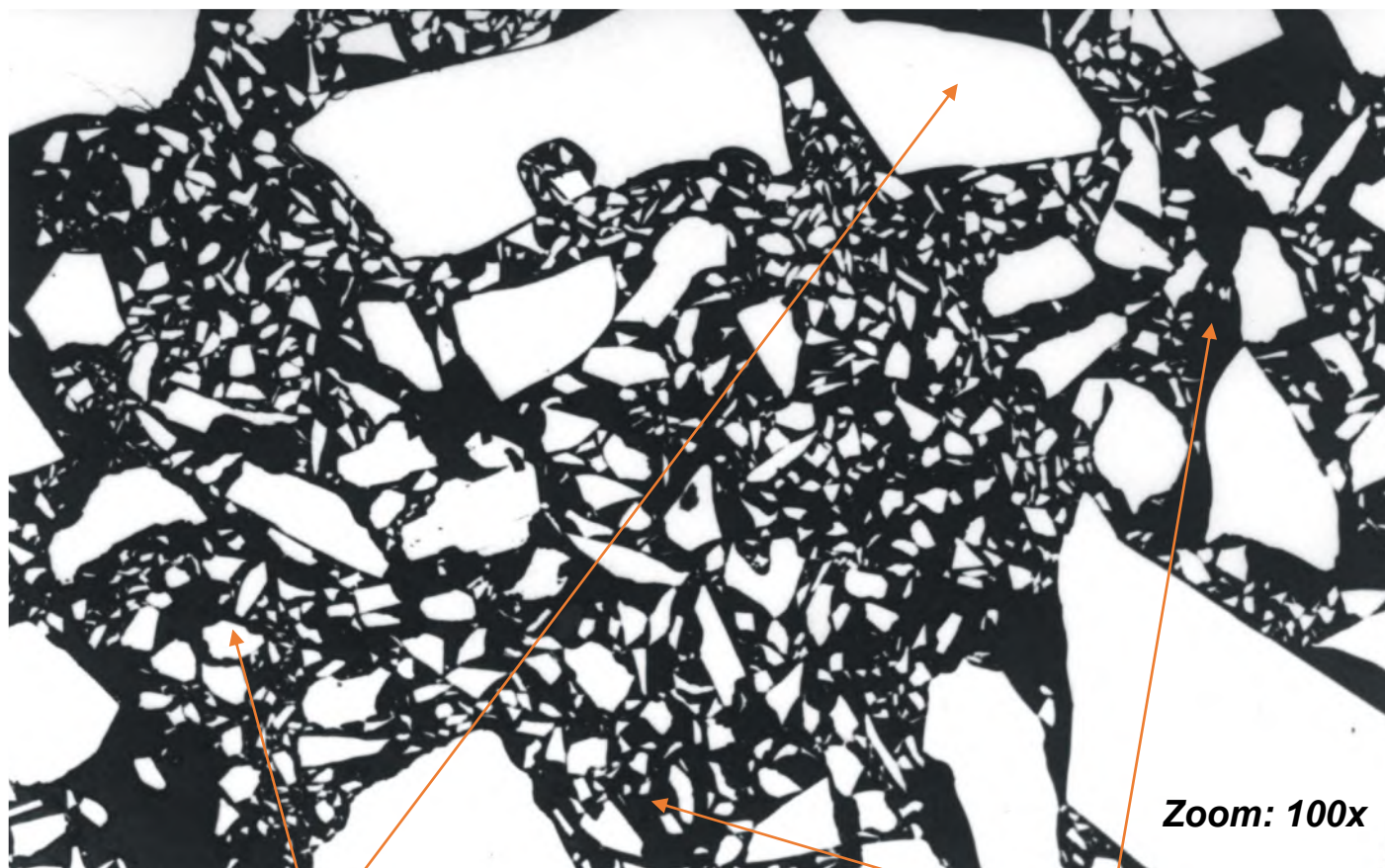
Polished section scale 500:1



SICcast[®]

1. **Bonding Agent**
2. **Bonding Agent that has penetrated into a SiC grain**
3. **Ground, polished SiC grain**

SICcast® - The Material



Zoom: 100x

Silicon Carbide: >80%

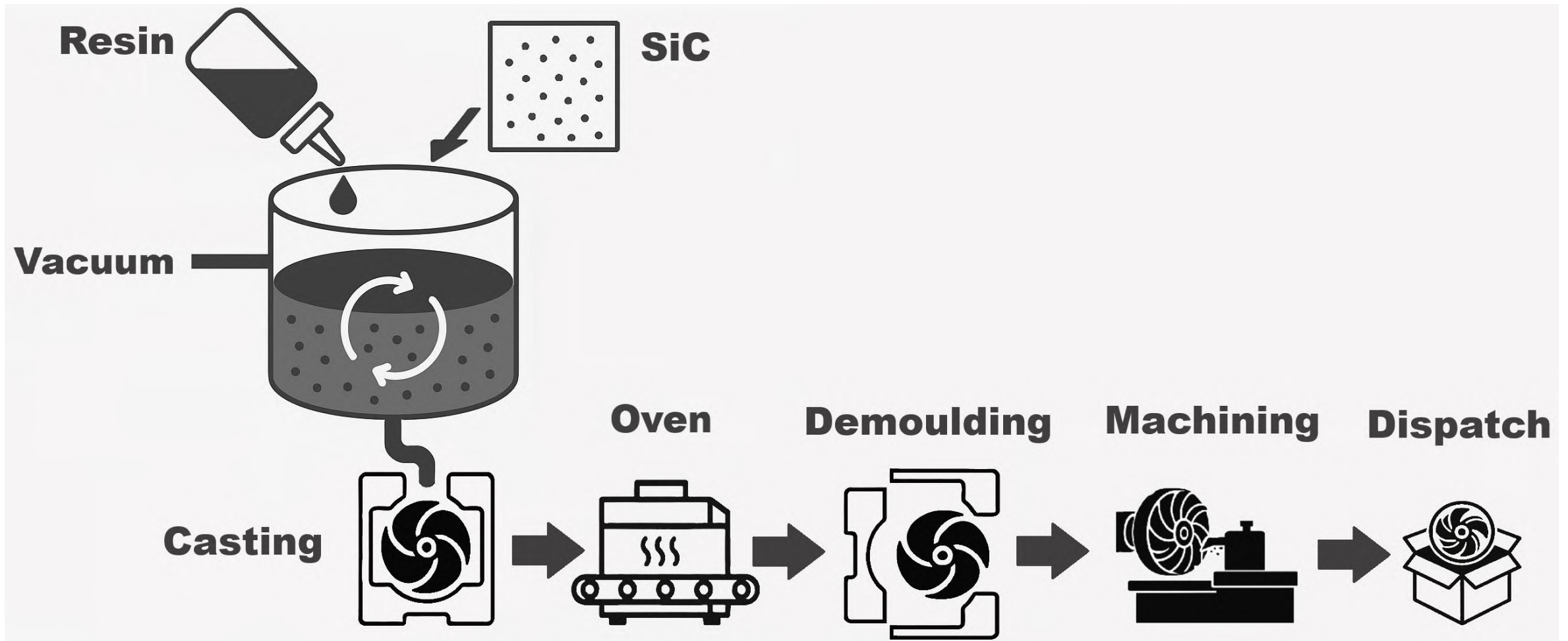
Epoxy Resin: <20%



+



SiCast[®] - Process

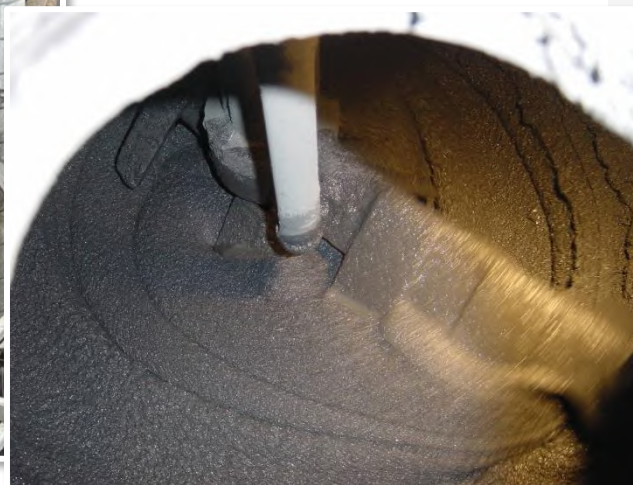


SICast[®] - Process: SiC supply



- SiC supply in two quantities
- Each optimized to Fuller curve
- Max. packing density

S/Cast[®] - Process: Preparation



- High wear resistance equipment
- Vessel under vacuum
- Heating or cooling system
- Full automatic processing

S/Cast[®] - Process: Casting



- Material is pumped into moulds
- Material is bubble-free
- Casted into mould under atmosphere pressure

S/Cast® - Process: Mould design



- Precise steel moulds
 - 3D printed moulds for special cases
- Various core materials
 - PU (lost core)
 - Wax
 - Aluminium
 - Silicone

SICast[®] - Process: Curing



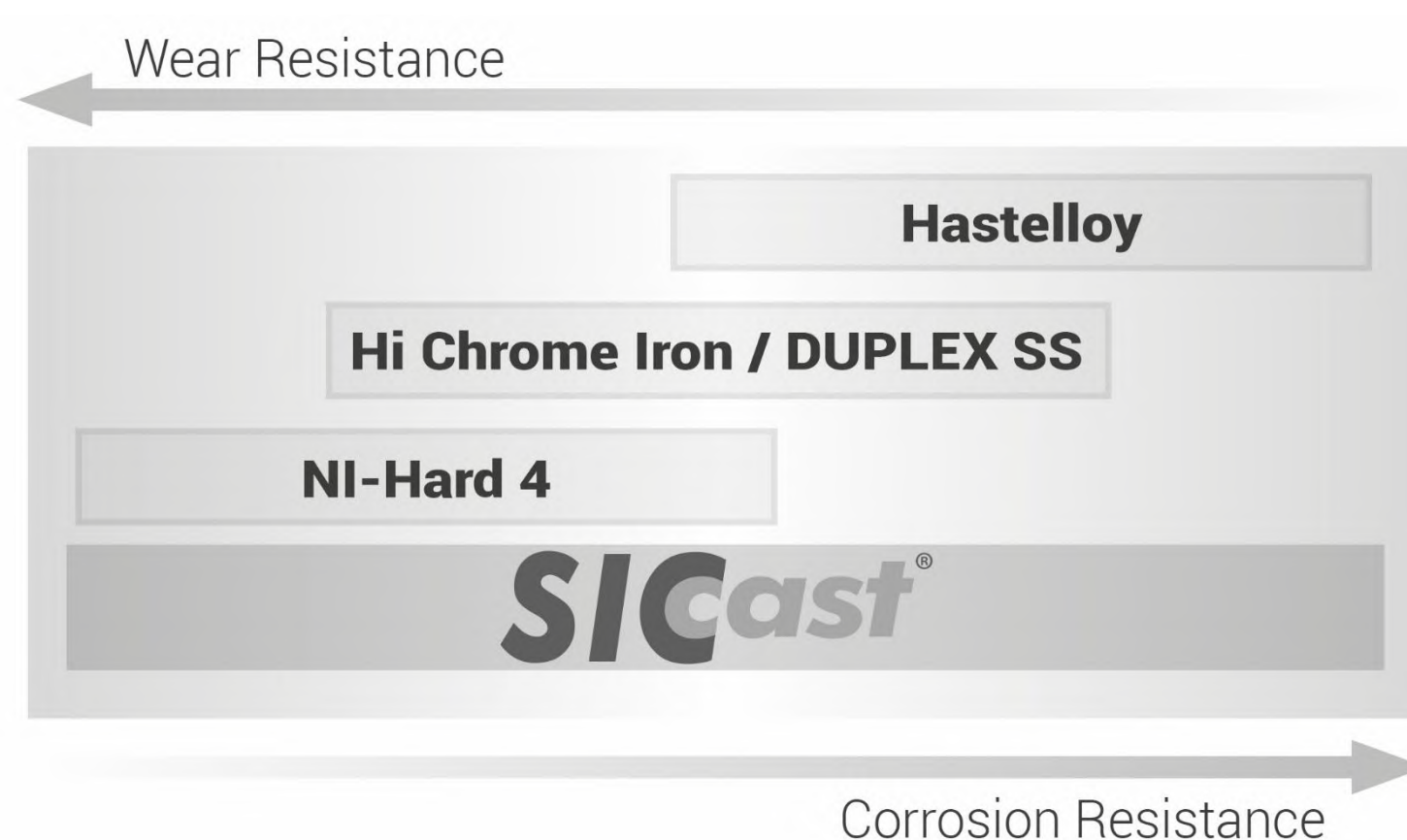
- Heated up to 60°C for 14 hrs
- Ovens designed to heat up the parts from bottom
- Slow curing – low shrinkage
- Reduces tensions to zero

SICast[®] - Process: Machining



- Using diamond tools only
- High wear on tools
- Machined areas are reduced to minimum
- Requires specific federates to minimize tooling wear

Comparison of Materials in terms of corrosion and abrasion resistance

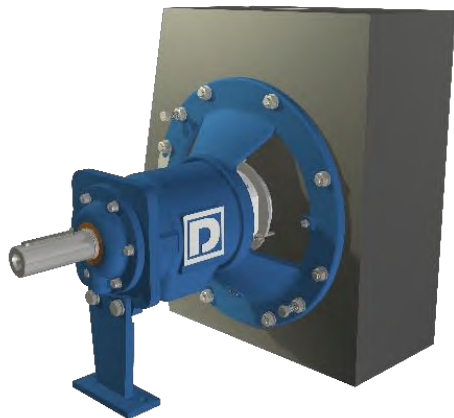


Advantages of **S/**Cast®

- 100% Corrosion Resistance – Lifetime Anti-Corrosion Warranty
- Specifically Designed for Wet FGD Scrubber Systems
- Diamond-Like Abrasion Resistance (9.7 Mohs Hardness)
- Reduced Noise/Vibrations Compared to Metallic Pumps
- Ductile Matrix, High Resistance to Impact and Thermal Shock
- Internal Quality Control of Castings/Ability to Repair
- Highly cost competitive to exotic metallurgies (Super Duplex Stainless, High Chrome Iron) that are susceptible to erosion-corrosion wear

Mineral Cast Slurry Pumps - *SICast*[®] for severely corrosive and abrasive fluids

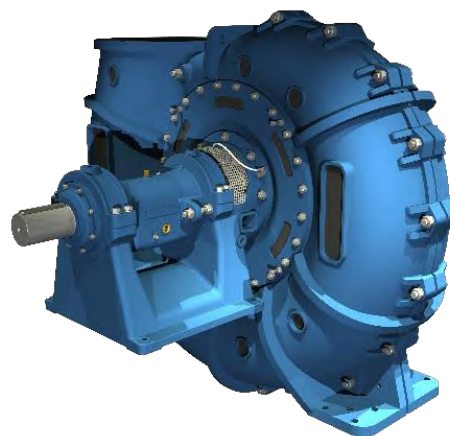
MC



MCS



MCC



MCV
VS3



MCV
VS5



Wet FGD Absorber Bleed Pump

SICcast vs. High Chrome Iron

- Existing Equipment:
 - Goulds JC High Chrome
- Operation Parameters
 - Fluid Medium: Gypsum Slurry (SG 1.2)
 - 20-30% solids, 4-5 pH, 7,000ppm Cl-
 - 1175 gpm @ 133ft TDH
- End User's Gypsum Bleed Pump was suffering from severe wear, requiring complete pump wet end rebuilds every 6 months.
- Goulds JC was replaced with a MC pump with fully casted SICcast components originally as a trial service. Opened the pump after 6 months of operation and discovered little to no wear on the impeller (picture to the right).
- Installed in February 2018, first MC pump with mechanical seal lasted 5 years prior to rebuild. Improvement of 10x longevity on wet end hydraulics vs. the original high chrome components



SICcast MC Pump

Impeller – 6 months



Wet FGD AR Pump Recycle Impeller – SICcast MCC Series

- Operation Parameters
 - Fluid Medium: FGD Gypsum Slurry
 - % Solids: 15-25%
 - pH: 4-7
 - 10,000 ppm Cl-
 - 27,700gpm @ 105ft TDH
 - 670RPM
- Pumps have been in operation since 2011, end user wanted to perform preventative maintenance check and wet end inspection.
- Once received, pictures were taken of the impellers' condition after 10 years operation shown to the right.



SICcast Impeller Eye



SICcast Impeller
Vane Edge

Siconit[®] Maintenance Technology

Two-Component System



1kg (2.2lb) can **Siconit[®]** with hardener



Silicon Carbide (up to 80%)

- Synthetic mineral
- Chemical connection between silicon and carbon
- Hardness Mohs 9,7 (diamond: 10 Mohs)
- Chemically inert
- High availability in industry

Expoxy resin

- High strength
- Low shrinkage
- High adhesion
- Two component hardening
- High wetting of SiC
- Solvent free

SIConit[®] Maintenance Technology

Different Versions of SIConit



SIConit[®]
for trowelling



SIConit[®] X
brushable coating



SIConit[®] K
for pouring



SIConit[®] Repair Process

① Worn Component For Repair



② Pre-Machining



③ Welding Support Mesh/Molds



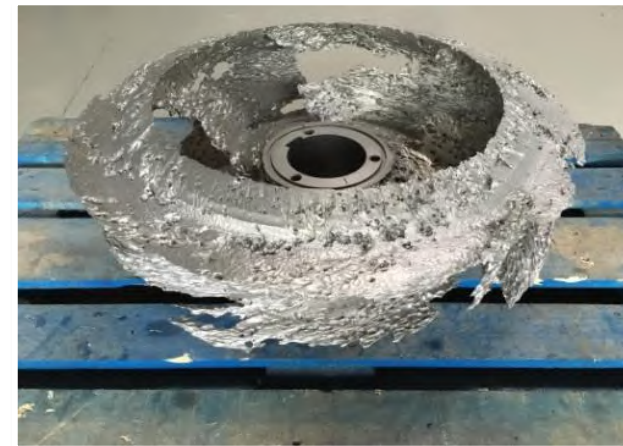
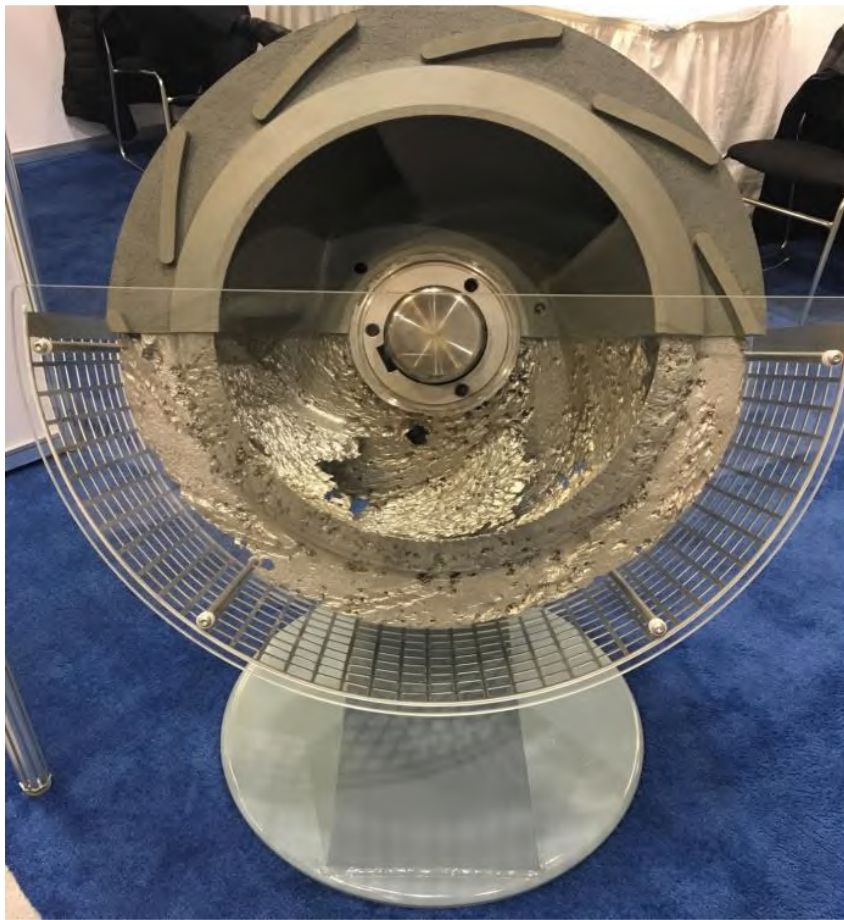
⑤ Repaired and Ready for installation



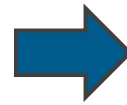
④ Application of SIConit / Final Machining



Silonit® - Duplex SS FGD Absorber Recycle Impeller



Slocnit® - Wet FGD AR Pump Repair – Warman GSL



Siconit® - Wet FGD AR Pump Repair – Warman TUL



Silonit® - Wet FGD AR Pump Repair – GIW



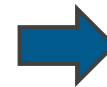
Silonit® - Wet FGD AR Pump Repair – Metso



Silonit® - Wet FGD AR Pump Repair – Townley



Silonit® - One Week Repair – AR Pump Backplate



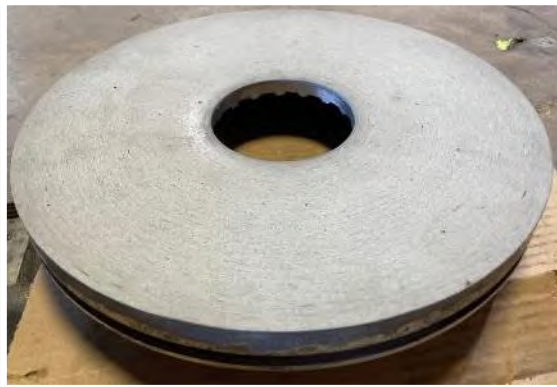
Wet FGD Absorber Recycle Impeller

SiConit Repair vs. High Chrome

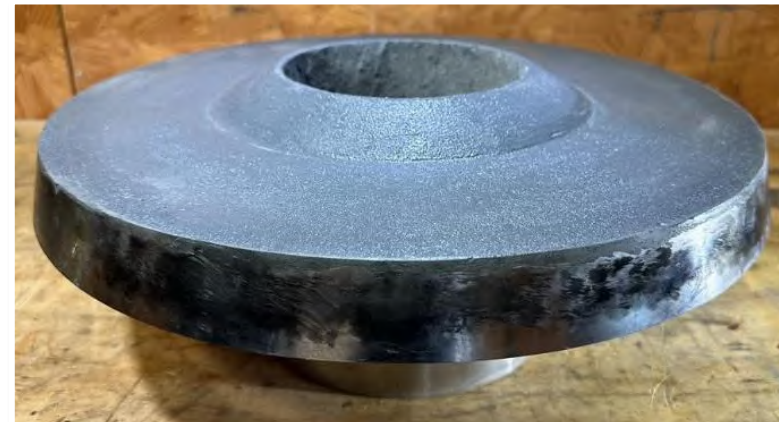
- Existing Equipment:
 - GIW 38x38 High Chrome Wet FGD AR Scrubber Pump Impellers
- Operation Parameters
 - Fluid Medium: Gypsum Slurry
 - % Solids: ~15-17%
 - 3,000-10,000 ppm Cl-
 - pH: 5 - 6.5
- As a true comparison, the end user rebuilt two of their GIW AR pumps side by side: One AR pump with a new OEM high chrome impeller, and one pump with a previously worn GIW impeller repaired with SiConit material.
- Both impellers were inspected after 7 years of operation. Impeller conditions are shown to the right
- Cost savings of a SiConit repair on FGD AR impellers range from 30-50% cost of new



Slonit® - Gypsum Bleed Pump Wet End Rebuild – High Chrome



Silonit® - Warman AH Ball Mill Product Pump Wet End Rebuild



Slonit® - Agitator Blade Refurbishment



Silonit® - Wet FGD Scrubber Agitator Blade Refurbishment



Case Study: Wet FGD Absorber Agitator Blades SIConit Lining for Improved Life

- Equipment: Ekato 1600mm Wingjet Agitator Blades
 - Operation Parameters
 - Fluid Medium: Limestone/Gypsum Slurry
 - % Solids: ~15-17%
 - 3,000-10,000 ppm Cl-
 - pH: 5 - 6.5
 - 125-150RPM
- Customer refurbished their existing 1600mm Wingjet Agitators to achieve longer service life, originally seeing 1-2 years before replacement
- Pictures to the right show the Agitators after 6 years of operation – No measurable wear indicated.



Unlined



Rubber Lined



FRP



Sionit® - Wet FGD Cermic Tiled Reducer – Repair and Lining



Slonit® - AR Pump Discharge Pipe Fabrication and Lining



Advantages of **SIConit**[®] Refurbishment Process

- Cost savings range from 25-50% in comparison to new OEM spares in higher grade alloys (Duplex SS, Hi Chrome Iron, Titanium, etc)
- Can be utilized for any existing metallic or polymer lined pump OEM (Warman, GIW, Townley, Metso, etc.).
- Initial cost savings are combined with improved wear life through SIConit's combined complete corrosion/diamond-like abrasion resistance
- Scope of repair can be coordinated for specific wear mechanisms driving component replacement
- Expedited repair lead times vs longer OEM High Chrome/Duplex SS Spares (as quick as 1-2 week turnaround depending on scope and criticality)
- Ability to repair various process equipment subject to high wear/maintenance expenses (Reactor Agitators, Gypsum Piping/Elbows, Basins, Ash Separators, Clarifier Rakes, etc..)

Specific Limitations of SICcast and SIConit Materials

- **Temperature – Glass Transition Temperature limits**
 - SICcast – Heat Casted Components – Max Temperature 350F
 - SIConit – Cold Cure Coating– Max Temperature 210F
- **Max Particle Size**
 - General Max particle size: 5mm (0.2")
 - Fully dependent on each specific application and type of particles being processed
 - Best wear life achieved when majority of particles are fine in size (<1-2mm)
- **Acid Concentrations**
 - Specific limits on concentrations of various acids per SICcast chemical resistance chart





A photograph of industrial machinery, specifically large blue pumps and white pipes, arranged in a row. The pumps are mounted on concrete bases and connected to a network of pipes. The scene is set in an industrial environment with a concrete floor and various mechanical components visible.

Quality through experience
since 1938

Thank you!



Josh Vines, PMP
Sales Manager – North America

Duechting Pumps North America, LP