

Water Supply and Reuse



Enabling Beneficial Water Reuse

Mining is one of the largest industrial uses of water globally, making management solutions critical to sustainable operation. The Dow Chemical Company is the largest global supplier of advanced water treatment components. Dow provides integrated solutions designed to help deliver the right water quality from any natural water source that is locally available. Dow's water treatment technology helps facilitate a secure, safe and reliable water supply and enables beneficial water reuse to local mining operations.

The Power of ORE

From increasing cost pressures, to more stringent environmental and safety regulations, to declining ore grades, the mining industry faces numerous challenges impacting profitability. Dow is helping to address these challenges with the Power of ORE – a wide range of products and expertise to address a broad spectrum of mining, mineral processing and remediation challenges.

The Power of ORE gives companies striving to extract more value from mining operations a real choice in the marketplace. Dow can help enable Operational efficiency, boost Recovery enhancement and facilitate Environmental protection.

Water Supply and Reuse Offerings and Solutions

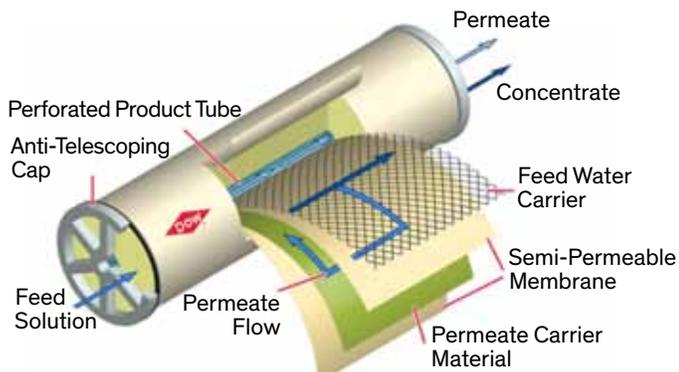
Function	Dow Product	Description
Membrane Filtration	FILMTEC™	RO and nanofiltration membranes
	DOW™ Ultrafiltration	Ultrafiltration membranes
Particle Filtration	TEQUATIC™ PLUS Filter	Combines the power of continuously cleaning, cross-flow filtration with centrifugal separation and solids collection into one device
Antiscalants	ACUMER™	Scale inhibitors and dispersants for water treatment, 1000 – 5000 series
	VERSENE™ and VERSENEXT™	EDTA and DTPA-based scale removers and inhibitors
Biocides	AQUACAR™	Broad spectrum microbiocides

Dow's filtration technology is the key to successful water treatment and reuse in your mining operation. Our filtering systems allow water to be processed from even the most challenging sources – such as seawater, fresh or brackish groundwater and surface waters. Mining operations located in water-stressed areas can benefit from dedicated membrane installations to reduce the water footprint and treat wastewaters to the right quality for beneficial reuse. Dow's antiscalants and biocides provide increased operational capacity and efficiency by reducing downtime and maintenance and adding longevity to your water treatment assets.

FILMTEC™ Reverse Osmosis (RO) and Nanofiltration (NF) Membranes are specially designed for demineralizing brackish water or desalinating salt water for process feed and recycle water streams. FILMTEC™ Elements offer proven performance, high rejection, high flux and exceptional robustness and durability across a wide range of feed conditions. This results in:

- Excellent water quality
- High yields
- Good cleanability resulting in long element life

These features offer system operators long-term economics and trouble-free operations for NF and RO membrane purification of fouling water.



FILMTEC™ Spiral Wound Filter Element

DOW™ Ultrafiltration (UF) modules, based on our proven polyvinylidene fluoride (PVDF), outside-in fiber technology, set the standard for suspended solids removal for RO pre-treatment and wastewater treatment applications. They are designed to serve as a pretreatment step to FILMTEC RO and NF products.

Key features include:

- Low chemical consumption
- High recovery
- Exceptional combination of mechanical properties and chemical resistance

The TEQUATIC™ PLUS Filter is specifically designed to treat difficult feedwater up to 10,000 mg/L of suspended solids without frequent filter changes in the presence of oils and high molecular weight molecules. Key benefits include:

- Lower maintenance costs
- Higher uptimes
- Higher water recovery, typically > 99%
- Decreased consumables costs
- Smaller footprint due to less waste, space and chemical needs



TEQUATIC™ PLUS Filter

ACUMER™ polymers are used in water treatment as scale inhibitors and dispersants for cooling-water systems, boilers and membrane filtration units.

ACUMER™ Product	Description/Application
1000	General-purpose acrylic acid homopolymer scale inhibitor
1010	General-purpose polyacrylic acid homopolymer scale inhibitor for water systems
1035	General-purpose acrylic homopolymer dispersant for RO membranes
1050	Partially neutralized polyacrylic acid polymer scale inhibitor
1051	Fully neutralized polyacrylic acid polymer scale inhibitor
1100	General-purpose polyacrylate homopolymer scale inhibitor
1110	General-purpose polyacrylate homopolymer scale inhibitor
1510	Polyacrylic acid homopolymer for general dispersant applications
1850	Thermally stable, polycarboxylate dispersant for boiler treatment
2000	Copolymer stabilizer for cooling water treatment
2100	Carboxylate/sulfonate copolymer dispersant and scale inhibitor for water systems
2200	Carboxylate copolymer dispersant for industrial water
3100	Terpolymer stabilizer for water treatment
4161	Phosphinopolycarboxylic acid scale inhibitor for water treatment
4300	Exceptional scale inhibitor for calcium carbonate and sulfate control
4800	High-performance scale inhibitor for RO membranes and thermal desalination processes
5000	Exceptional scale inhibitor for silica and magnesium silicate control

Stability Constants (Log K Values)¹

Chelating Agent	Metal Ions														
	Al ³⁺	Ba ²⁺	Ca ²⁺	Cd ²⁺	Co ²⁺	Cu ²⁺	Fe ²⁺	Fe ³⁺	Hg ²⁺	Mg ²⁺	Mn ²⁺	Ni ²⁺	Pb ²⁺	Sr ²⁺	Zn ²⁺
EDTA ²⁻	16.4	7.9	10.7	16.5	16.5	18.8	14.3	25.1	21.5	8.8	13.9	18.4	18.0	8.7	16.5
DTPA ²⁻	18.6	8.7	10.8	19.0	18.8	21.2	16.2	28.0	26.4	9.3	15.2	20.1	18.8	9.8	18.2

¹A.E. Martell, R.M. Smith, NIST Critically selected stability constants of metal complexes (NIST standard references database 46, version 7.0, 2003)

²VERSENE™ products are based on EDTA and VERSENE™ products are based on DTPA

VERSENE™ and VERSENE™ Chelating Agents effectively remove many types of scale deposits that can cause reduced flow rates and heat transfer efficiency. They are also widely used in combination with polymers (ACUMER™ products) for the control of scales containing calcium, magnesium and iron, to name a few. It is important to consider the stability constant (K), expressed as log K, of the complex formed between the metal ion and the chelating agent to determine whether the complex will be formed in the presence of competing anions. Higher log K values indicate the complex is more likely to form.

AQUCAR™ Water Treatment Microbiocides have shown substantial effectiveness in controlling microorganisms in water-handling systems where fouling and/or microbially influenced corrosion present problems. This utility has been demonstrated in both aerobic systems, such as recirculating cooling towers, and anaerobic systems, where sulfate-reducing bacteria cause corrosion. Dow AQUCAR antimicrobial products address a number of critical performance needs for today's mineral producers including:

- Quick kill
- Limited tolerance by microbes
- Stabilized slurries
- Corrosion management



Microbial-induced corrosion (MIC) in pipes

Dow's History in the Mining Industry

Since our earliest roots isolating compounds from prehistoric brine in the 1890s, to pioneering chemistries for froth flotation processes, to developing innovative technologies for water treatment and reuse today, Dow has continued to innovate to help customers extract more value in the mining industry.

Dow is a world leader in membrane (RO/NF/UF) and ion exchange technologies, and provides a powerful portfolio of chemistries and solutions to address:

- Mine water management, including tailings and waste treatment
- Slurry management
- Dust control
- Grinding and milling
- Flotation and hydrometallurgy, focused on maximizing metal recovery utilizing select chemistries, polymer additives and ion exchange technologies

Commitment to Sustainability

Dow's commitment to sustainability is infused into the very DNA of our Company. In 2006, we launched our current set of 2015 Sustainability Goals, which focus not only on the Company's footprint in our own operations but also our handprint through the positive impact of Dow products and their role in global sustainable development. Focused on addressing global challenges like water, food, climate change and energy, Dow has made significant progress against these goals. For more information on how sustainability is integrated into all aspects of our business and operations, please visit www.dow.com/sustainability.



Product Stewardship and Safety

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products – from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

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