

Acid Mine Drainage



Meeting Purification and Separation Challenges

Acid mine drainage (AMD) waters with high contamination can be cost-effectively treated with tailored nanofiltration (NF) membranes, optimized operation protocols and appropriate system designs. Dow's membrane technology has intrinsic advantages versus alternative separation technologies to meet broader purification and separation challenges for these drainage waters. Dow technologies deliver a reduced sulfate, manganese, heavy metal and fluorine concentration to generate permeate flows that meet local regulatory levels for disposal and/or reuse.

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.

Acid Mine Drainage Offerings and Solutions

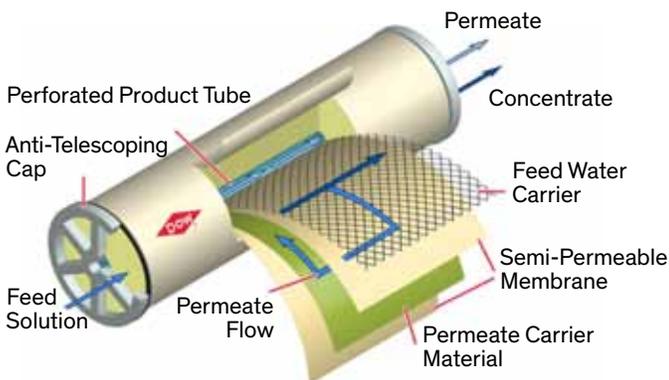
Function	Dow Product	Description
Membrane Filtration	FILMTEC™	RO and nanofiltration membranes
	DOW™ Ultrafiltration	Ultrafiltration membranes
Antiscalants	ACUMER™	Scale inhibitors and dispersants for water treatment, 1000 – 5000 series
	VERSENE™ and VERSENE™	EDTA and DTPA-based scale removers and inhibitors

Dow provides integrated solutions to help our customers tackle their acid mine drainage problems. Dow's filtration technology is the key to successful water treatment and reuse in your mining operation. The cost-effective use of FILMTEC™ Membranes in challenging waters can be achieved with proper pre-treatment using DOW™ Ultrafiltration products and operational protocols that include antiscalants VERSENE™, VERSENE™, and ACUMER™ products.

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

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

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

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

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.

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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*Toll-free service not available in all countries

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