

REVERSE OSMOSIS TROUBLE SHOOTING GUIDE

Cause	Possible Location	Differential Pressure (DP)	Feed Pressure (TMP)	Salt Passage
Metal Oxide Fouling (Fe ₂ O ₃ , MnO ₂ , NiO, ZnO)	1 st stage lead elements	Rapid increase	Rapid increase	Rapid increase
Colloidal Fouling (iron, clay, organic)	1 st stage lead elements	Gradual increase	Gradual increase	Slight increase
Mineral Scale (CaSO ₄ , CaCO ₃ , Mg(OH) ₂ , BaSO ₄ , SrSO ₄)	Last stage tail element	Moderate increase	Slight increase	Large increase
Polymeric silica	Last stage tail element	Normal or increase	Increase	Normal
Biofouling	Any stage, usually lead element	Marked increase	Marked increase	Normal
Organic Fouling (dissolved NOM)	All stages	Gradual increase	Increase	Decrease
Anti-scalant fouling	2 nd stage most severe	Normal to increased	Increased	Normal
Oxidant Damage (hypochlorite, Ozone, KMnO ₄)	1 st stage most severe	Normal	Decreased	Increased
Hydrolysis damage (outside pH range)	All stages	Normal	Decreased	Increased
Abrasion damage (carbon fines, media sand etc)	1 st stage first element most severe	Increased (blocking)	Decreased	Increased
O-Ring leaks	1 st stage most severe	Normal	Normal	Increased
Glue line Leaks (due to permeate back-pressure in service or standby)	1 st stage most severe	Normal	Normal	Increased
Glue line leaks (permeate back pressure during)	Tail element of a stage			Increased

REVERSE OSMOSIS CLEANING GUIDE

Cause	Description	Verification	Removal
Metal Oxide Fouling (FeO ₂ , MnO, NiO, ZnO)	Precipitation of dissolved metals caused by oxidation or pH changes in the RO plant	Analysis of metals in filtered vs unfiltered influent water after chemical addition	Acid cleaning Chelate cleaning (EDTA) Reductive cleaning
Colloidal Fouling (iron, clay, organic)	Fine colloidal material washing into RO system	SDI/Turbidity measurement of influent water	High pH cleaning using NaOH Low pH cleaning Surfactant cleaning
Mineral Scale (CaSO ₄ , CaCO ₃ , Mg(OH) ₂ , BaSO ₄ , SrSO ₄)	Precipitation of minerals as water concentration increases and exceeds saturation level	Water Modeling Historical water quality changes	Acid cleaning or chelating (EDTA) cleaning
Polymeric silica	Silica scales in RO systems by polymerizing on the membrane surface	Analyze influent water (reactive silica)	Difficult to remove, high pH may work Replacement
Biofouling	Bacterially produced EPS slimes coat membrane surface	Inspect plant for signs of bacterial fouling	Caustic cleaning and potentially enzymatic cleaning
Organic Fouling (dissolved NOM)	Organic materials (tannin, humates etc.) coat the membrane surface	Analyze influent water	Caustic cleaning and potentially enzymatic cleaning
Anti-scalant fouling	Precipitation of antiscalants with incompatible water	Anti-scalant compatibility test	Difficult to clean
Oxidant Damage (hypochlorite, Ozone, KMnO ₄)	Damage of membrane active layer by oxidizers	Analysis of historical data	Replacement
Hydrolysis damage (outside pH range)	Damage of membrane active layer by pH <1 or >12	Analysis of historical data	Replacement
Abrasion damage (carbon fines, media sand etc.)	Membrane scratching by sand, carbon or other solids bypassing the cartridge filters	Inspect lead end of 1 st stage membranes	Replacement
O-Ring leaks	Poorly fitting, damaged O-rings due during placement or operation	Historical Delta P	Remove and re-seat membranes
Glue line Leaks	Membrane damage due to back-pressure on permeate side	Historical Trans-membrane pressure (TMP)	Replacement