

EDI Membrane Life Expectancy

Bulletin Brief

What is the life of a fine bubble membrane? This is a question asked regularly and seems simple enough; however, a proper answer requires a thoughtful response.

Membrane life must be separated into 2 separate categories:

Mechanical Life - Also known as physical life, mechanical life is defined as how long membrane may remain in place or physically exist. A unit that is **still mechanically intact may not actually be functional!**

Economic Life - The realistic life of a membrane that provides acceptable oxygen transfer efficiency and keeps operating with an acceptable pressure.

Technical Presentation

Advanced Polymer Chemistry Assures Optimum Performance

Many vendors of membrane aeration systems do not have an operating history of their membranes to demonstrate or confirm their membrane life claims. EDI membranes have proven performance in thousands of applications to substantiate actual performance. In addition, EDI's Membrane Technologies Division applies advanced polymer chemistry and advanced manufacturing techniques to assure optimum membrane performance with maximum *economic* as well as proper physical life.

Advanced technology membranes will deliver optimum performance for 3-10 years. For sewage applications, typical design economic life is 5 years with most projects performing beyond the 5 year average. For special wastes such as special industrial applications or very aggressive wastes, expected membrane life is reduced.

Optimum Performance Defined

Optimum performance for a membrane's economic life is defined as delivering full oxygen transfer efficiency with stable operating pressure drop across the membrane. If membrane pressure increases more than 25% above a clean membrane, this is considered the upper limit of acceptable membrane performance (life). Sometimes routine maintenance or cleaning can reduce the membrane pressure, providing additional economic life. If no improvement in pressure is obtained after cleaning or maintenance, the economics of replacement should be reviewed.

It is less costly to install new membranes that operate at lower pressure and reduce energy than to continue to operate the high-pressure existing units! Pressure increases are the most common limitation to economic life of membranes.

Oxygen transfer changes can also limit the economic life of membranes. Oxygen transfer can deteriorate during membrane life because of several causes:

1. Poor membrane quality
2. Wrong membrane type for your wastewater
3. Shrinkage (or stretch) with poor air distribution
4. Fouling

If routine maintenance can restore oxygen transfer performance, a membrane's economic life is extended. If the loss of efficiency continues it is generally far more economical to replace membranes to restore efficiency and reduce energy cost.

Guidelines for Calculating Membrane Life

EDI suggests membrane life be considered as follows:

Economic Life: 3-10 years. Municipal or sewage design at 5 years. Be sure to select quality engineered membrane polymers and engineered physical characteristics developed with advanced technology manufacturing techniques.

Physical Life: Not a design limit as economic life will control.

Factors which influence membrane life:

- Proper membrane compound selection.
- Quality membrane manufacturing.
- Air flux (airflow per square foot or square meter of membrane). Higher flux rates reduce membrane life as well as reduce diffuser efficiency.
- Chemical composition of wastewater.
- Temperature of wastewater.
- Exposure to sunlight for extended periods.
- Proper diffuser construction to support and protect the membrane.
- Proper diffuser installation and maintenance.

Properly designed and engineered membranes provide maximum performance resulting in reduced installation, operation, and maintenance costs for most applications. For proper membrane evaluation, operation costs and membrane life expectancy must be factored into the analysis when membrane replacement is required.

Membrane Technologies Division

The EDI Membrane Technologies Division offers major benefits to clients by providing several polymer compounds that can be selected for specific wastewaters or specific applications.

Membrane selections include the ability to engineer special membrane systems for different wastewaters.

Refer to Technical Bulletin Number 114 for details on types of membrane polymers and compounds available from EDI.

Membrane Technologies support is also available with membrane evaluations. Test membrane systems are available with laboratory support to predict membrane performance in your wastewater and to optimize membrane economic life. EDI laboratories also provide evaluations of existing membrane units to determine membrane suitability for continued economic viability.

For specific information on proper design and evaluation of your existing system contact Environmental Dynamics, Inc. at 573-474-9456