Cobargo is a rural, residential settlement located in the north of the Bega Valley Shire. The village has a permanent population of roughly 400 people and a small holiday population during peak tourist periods. The village has a busy commercial area located on both sides of the highway. The previously used septic systems consisted of absorption trenches, transpiration beds and aerated systems that were considered to be ineffective for the number of households serviced in the area and the soil type.

Wolumla is a small rural village to the south of Bega Valley. The township has a permanent population of around 380 people and also has a small holiday population during peak tourist periods. The township is predominantly low-density urban housing with a small commercial area located on the main street including a hotel and general store. Like Cobargo, Wolumla relied on septic systems.

Candelo is a small rural residential settlement located on the coastal hinterland approximately 12.4 miles southwest of Bega Valley. The village has a permanent population of about 350 people. A small commercial area is located on the main street. Dairy and beef properties are located along the Candelo Creek floodplain and extend into the rolling hills surrounding the village. Candelo also relied on septic systems.

Kalaru is a small rural, residential settlement located in the Bega Valley Shire on the far south coast of NSW. The township has a permanent population of about 300 people, with a considerable increase in population during peak holiday periods.

The township consists of mainly low-density housing and contains a large caravan park, which serves as both holiday accommodations and permanent residences. Kalaru also relied on septic systems that were considered to be ineffective due to the number of households serviced and the soil type in the area.

Bega Valley Sewerage Program

The BVSP is an alliance formed between Tenix Alliance and the Bega Valley Shire Council to upgrade the five existing sewage treatment plants and install greenfield sewerage systems for five villages in the region.[1] The program includes updating the existing plants to biological nutrient removal facilities and installing new pressurized sewage collection systems coupled with MBR treatment plants in the towns of Cobargo, Wolumla, Kalaru and Candelo.

The program as a whole is designed to keep capital and operating costs at a minimum and to produce a high-quality effluent for reuse. The reclaimed water from the upgraded existing plants will be used for golf courses adjacent to the plants and at a nearby dairy farm. Reclaimed water from the MBR plants will be used in an irrigation scheme on public facilities such as the Cobargo Showground, Wolumla Recreation Reserve, Candelo Showground and the Sapphire Coast Turf Club, replacing potable water as the primary source. In the future, reclaimed water may also be used for toilet flushing and to provide a vehicle washdown facility.

The four MBR systems are identical, resulting in significant cost savings for the Bega Valley Shire Council and the community. Each system is designed for 800 people equivalents or an annual average flow of 180 m^3/day (47,000 gpd). The maximum daily flow is 300 m^3/day (80,000 gpd) and the peak hourly flow is 360 m^3/day (95,000 gpd).

Each plant includes prescreening with 3-mm perforated plate screens followed by a biological treatment system with nitrification and denitrification. The UF membranes are submerged in the mixed liquor and are used to separate the treated wastewater from the suspended solids. Each plant has a footprint of approximately 66 ft by 49 ft, and each system includes two modules of 235 m^2.

Applications for Rural Areas

The Cobargo MBR plant was commissioned in July 2006, and the three other plants of Wolumla, Kalaru and Candelo were commissioned in 2007. The plant at Cobargo is shown in Figure 3.

MBR technology can be an appropriate choice for rural areas because it provides excellent water quality without the risk of upsets that can occur with a secondary clarifier. Additionally, an MBR system can operate with minimal supervision but still guarantee high water quality appropriate for reuse.

Many MBR systems in remote areas are designed with a SCADA system, allowing remote access to the data with an operator visiting the plant on a daily or weekly basis to perform checks, routine maintenance and top up chemical tanks. MBR systems occupy approximately half the footprint of more conventional wastewater treatment plants and are therefore less visible to the community. If desired, an MBR system can be installed so that it completely blends into the landscape.

Many rural areas derive income from tourism and MBR technology supports this by providing a system that is less intrusive to the environment and provides high-quality water. Some rural communities have selected MBR technology to provide high-quality water for discharge in order to maintain the quality of their streams, rivers and lakes.

MBR effluent can also be recycled to provide additional water to the community to ensure sufficient water resources to cope with the additional water requirements of the tourist season. MBR effluent is reused today for irrigation of golf courses and parks and for toilet flushing in hotels.

The MBR systems supplied as part of the BVSP are helping several small communities reduce the risk of environmental and public health issues related to discharge from septic systems. Additionally, the MBR effluent is high enough quality to be recycled, providing additional water resources to the communities. *wqp*

Figure 2: Membrane Module Installed at Bega Valley

Figure 3: Cobargo MBR Plant

References

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MEMBRANE TECHNOLOGY for Rural Areas

By Antonia von Gottberg, Darren Lawrence & Christoph Kullmann

How membranes improved water quality in Australian villages

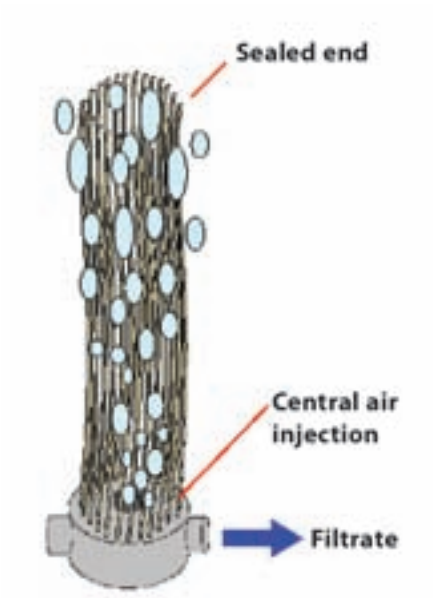
Membrane bioreactors (MBRs) with submerged membrane modules have set the standard for the next generation of biological wastewater treatment plants because they offer two main advantages: a significantly improved effluent quality and a substantially smaller footprint.

Aside from the major application in industrial wastewater treatment, there are also many municipal applications where MBR technology is being implemented. One example is the Bega Valley Sewerage Program (BVSP) in Australia.

Bega Valley is located on the southeastern coastline of New South Wales (NSW) and includes the towns of Cobargo, Wolumla, Kalaru and Candelo. The capacity of the valley's wastewater treatment systems was being stretched by urban growth, as well as seasonal population increases during the holiday period. Some unsewered villages in the valley were at risk for environmental and public health issues caused by discharge from septic tanks.

In order to maintain Australia's Environment Protection Authority compliance and to enhance environmental outcomes, the Bega Valley Shire Council developed the BVSP, which includes the installation of new pressurized sewage collection systems coupled with MBR treatment plants in the towns of Cobargo, Wolumla, Kalaru and Candelo.

Figure 1: Membrane Bundle



The Technology

In an MBR, ultrafiltration (UF) membrane modules are submerged in the activated sludge to combine the biological step and the solid-liquid separation into a single process. Because the membrane acts as a barrier, this improves the effluent quality. The membrane barrier also eliminates the secondary clarifier and allows the activated sludge to be more concentrated. This reduces the volume requirement for biological tanks, saving space and construction costs. The MBR process overall reduces footprint significantly compared to the combination of wastewater treatment followed by sand filtration or UF.

There are many different configurations of MBR technology. One example that optimizes both membrane and module design is the Puron submerged hollow-fiber UF module from Koch Membrane Systems. The module is designed to avoid clogging and sludging and features hollow-fiber membranes with a pore size of approximately 0.05 micron. The lower ends of the membrane fibers are fixed in a header while the upper ends are individually sealed and are free to move laterally as shown in Figure 1. All solids and particulates remain on the outside of the fibers while permeate is sucked out of the inside by means of a vacuum.

The fibers are arranged in bundles and are submerged vertically into the activated sludge. To maintain the filtration rate of the membrane modules, air scouring is carried out at regular intervals. An air nozzle is integrated into the center of the bundles to apply the air for scouring purposes. The central arrangement of the air nozzles inside the membrane bundles reduces the energy consumption because the air is injected at the place where the risk of sludging is highest. The module design ensures that even hairs and fibrous compounds will be removed reliably from the system so that a coarse prescreen can be used, improving capital and operating costs.

The individual fiber bundles are connected in rows, several of which are mounted into a frame made of stainless steel to form a module. The free-moving fibers combined with central aeration ensure stable filtration during plant operation, long membrane life and low operating costs by reducing the need for energy, cleaning and maintenance.

Bega Valley

Bega Valley Shire is located approximately 450 miles south of Sydney and is the largest local government in coastal NSW with a population of more than 30,000. The villages of Cobargo, Wolumla, Kalaru and Candelo, located in the Bega Valley, were unsewered and experienced challenges related to septic tank effluent discharge.