

## Who Invented MABR

### The History of MABR

We continue to be amazed by the number of companies that attempt to take credit for the invention of the Membrane Aerated Biofilm Reactor. You would think that for something that has only recently come to market (2013) that it would be easy to confirm who was responsible, but the reality is the concept has been around for a very long time. This is also one of the reasons that MABR patents are challenging to find as most of them have expired

Believe it or not there is a mention of this concept from as far back as the 1960`s when it was mentioned in two studies.

- B. Schaffer, F. J. Ludzack and M. B. Ettinger *Journal (Water Pollution Control Federation)* Vol. 32, No. 9 (Sep., 1960.
- *Journal of the Water Pollution Control Federation* 1960, 32, (9), 939-941.) Sewage treatment by oxygenation through permeable plastic films.

The second study used plastic films of unspecified material for oxygenation of a wastewater. Visible biological growth was observed on the polymer and it was reported that this had no observable effect on the oxygen transfer rate.

There does not appear to be any published literature between 1960 and 1978 . In 1978 Yeh and Jenkins (“Pure oxygen fixed film reactor”. *Journal of the Environmental Engineering Division, ASCE* 1978, 4, 611-623.) Reported results of experiments with Teflon tubes in synthetic wastewater. In the study the potential of the membrane for oxygenation was recognized. This work could have been inspired by the emergence of hollow fiber oxygenation systems in the biotechnology industry in the 1970s, where it was proposed for use in cell and tissue culture see for example Knazek, R. A.; Kohler, P. O.; Gullino, P. M.; Dedrick, R. L., *Cell-Culture on Artificial Capillaries - Approach to Tissue Growth in-Vitro. Science* 1972, 178, (4056).



The first mention of the terminology Membrane Aerated Biofilm Reactor (MABR) was in 1999 (Casey et al, Biotechnology and Bioengineering 1999, 62, (2), 183-192.) Casey is in fact one of the co-founders of OxyMem.



## There are currently three players in the MABR Market

- OxyMem formed a company to commercialise hollow fibre MABR membranes in 2013 and began selling them in 2014 (First client Enisca in June 2014)
- GE Water (Now Suez) began commercialising ZeeLung (hollow fiber) MABR in October 2015.
- Fluence (Formally EMEFCY) launched SABRE (Spiral Aerobic Biofilm Reactor) a flat sheet system based on oxygen permeable, or breathable, membrane technology. The product ran into performance challenges (it clogged) so in 2016 they pivoted and reconfigured the solution by moving liquid to gas side and gas to liquid side and decided that it could be a flat sheet MABR.

## So in summary, the credit for the following should be given to

### Invention of the technology:

1. B. Schaffer, F. J. Ludzack and M. B. Ettinger who saw the future some 50 plus years ago.

### Naming of the technology

1999 – I believe the naming credit should go to our own Professor Eoin Casey.

### First to commercialise

2014 – OxyMem achieved first commercial sales June 2014 with the MABR

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MABR can transform your Wastewater  
Treatment Plant

