ULTRAFILTRATION, A SOLUTION FOR SHELLFISH AQUACULTURE

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C. Cordier, C. Stavrakakis, B. Dupuy, M. Papin, P. Sauvade, F. Coelho, P. Moulin*

Laboratoire de Mécanique, Modélisation et Procédés Propres (M2P2-CNRS-UMR 7340), Aix-Marseille Université, Equipe Procédés Membranaires (EPM) Europôle de l'Arbois, BP 80, Bat. Laennec, Hall C, 13545 Aix-en-Provence cedex 04, France, clemence.cordier@univ-amu.fr

Some hatcheries can produce exotic shellfish (like polyploid oysters) with the risk that gametes and larvae reach the environment, threatening the local biodiversity. Therefore, effluents from farms must be treated but conventional processes are efficiency limited due to the quality of the water (UV) or produce by-products (oxidation). The objective of this work was to develop a new process to remove oyster gametes from shellfish hatchery effluents. The retention by ultrafiltration membrane was determined and the oyster gamete viability was evaluated after treatment.

Tests were carried out with a pilot able to treat 20 $m^3.d^{-1}$, continuously fed with seawater. This automated filtration unit included filtration, backwash and cleaning steps. First, several tests of seawater filtration were performed for different operating conditions. Sustainable conditions for which a modest degree of fouling occurs, providing a compromise between capital expenditure and operating expenses, have thus been determined. Then, two types of effluents were realized by addition of spermatozoa or oocytes from oyster *Crassostrea gigas*, to simulate (a) a chronic pollution: low concentrated effluents during a long time and (b) an accidental pollution: highly concentrated effluents during a short time to reproduce an accidental release of biological material during oyster maturation processes. Flow cytometry analyses were performed to determine gametes concentrations and assess their integrity before and after ultrafiltration.

As expected, the retention rate was 100 % whatever the gametes treated and their concentrations: spermatozoa concentration measured in permeate was lower than detection limit (Figure 1). More than 3 log removal is obtained whatever the inlet concentration for the oocytes and spermatozoa, demonstrating the relevancy of ultrafiltration for the treatment of these effluents. The hydraulic performances remained stable on the period of the tests (> 6 months) confirming that the process is adapted for this application. An impact on integrity of both oocytes and spermatozoa was observed in the case of backwash and more especially when membrane was first drained. In fact, in the case of spermatozoa, a drastic reduction of the number of these species was observed, from 50545 to 10340 spz.mL^{-1}, reflecting a loss of integrity (Figure 1).

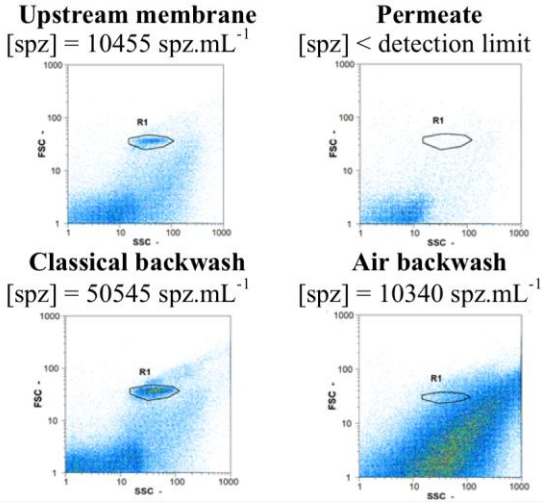

Figure 1 : Cytometry analyses – Treatment of spermatozoa

This ultrafiltration process allowed the protection of the marine environment biodiversity with (i) the retention of oocytes and spermatozoa whatever the filtration conditions and gamete concentrations and (ii) the sustainability of the process facing this organic pollution on the duration. Finally, filtration of real effluents coming from shellfish tanks was performed in order to determine the impact of microalgae and feces on the performances.