S2.5.3 - Prevention of Zebra Mussel Intake into Industrial Facilities Addressed by Filtration

Stefan Schoepf[1]
[1]Lenzing AG

Zebra mussels (dreissena polymorpha) are one of the most widespread invasive freshwater animals in the world and are in many areas the cause of tremendous problems within industrial facilities. This paper offers an approach on how to prevent zebra mussel of caused biofouling in industrial water intakes.

Identification and characteristics: The zebra mussel is a small shellfish named after the striped pattern of its shell. However, color patterns may vary, having also only dark or light-colored shells with no stripes. Typically, this mussel is attached to objects, surfaces, or other mussels by threads extending from underneath the shells. Whereas the mature zebra mussel can grow up to 25mm and even more, their eggs have only a size of around 50µm and its larvae (Zygote) is even smaller (down to 40µm). In this size they easily migrate into industrial facilities, grow-up inside and become for several reasons serious threats for the same.

Threats for industrial facilities through zebra mussel intake: Zebra mussels are notorious for their biofouling capabilities by colonizing water supply pipes of hydroelectric and nuclear power plants, public water supply plants, and industrial facilities. They colonize pipes and constrict its flow by reducing the intake in almost any process system. After such migration of zebra mussel eggs into industrial water intakes, they multiply fast and grow within a couple of days up to 250µm and over a period of months to their full size.

Possible solutions to address the zebra mussel threat: During the course of this study, this paper describes mainly the investigation of a multitude of filter ratings respective fineness to solve the addressed threat by means of filtrations technology. Besides this technology, also UV disinfection is taken into consideration. However, a special focus is laid on 100% separation of mussels and zygotes as even a very small percentage of living organisms into the filtrate could cause colonization and therefore the same threats as explained above.

Outcomes of joint research on example of automatic backwash filter: Together with the University of Valencia and the appendant laboratory, RIIA, the applicability of an automatic backwash filter to control zebra mussel colonization was evaluated. At a municipality close to Valencia, a pilot was installed. To evaluate the filtration performance, samples of feed and filtrate of the filter were taken and analyzed for the presence of replication-competent eggs and zygotes of zebra mussels. Whereas the feed showed a predictably high amount of zygotes of zebra mussels, the filtrate showed in all samples zero fertile mussel residues in using a specific filter material. One of the major reasons was the use of a highly precise manufactured 25µm square mesh weave as filter material. Wrapping up these results, the outcome of this study was that an automatic backwash filter hinders fertile dreissena polymorpha from migrating into the filtrate.

Stefan Schoepf

Holding a Master degree in process engineering and plant construction, Stefan is already working since ten years for LenzingFiltration, a specialized solid-liquid-filtration department of Lenzing Technik, which is a part of Lenzing Group. In 2010, he started as a start-up and commission engineer for high-quality filter systems of LenzingTechnik. Afterwards he moved to sales in order to convince industries like sugar, automotive or the chemical industry of the performance of Lenzing filters. In his current role as business development manager, he signs responsible for the research and development of new applications as well as for the establishment of Lenzing’s filtration technologies in new regions worldwide.