FILTERING EQUIPMENT

J. Gatignol
Project Manager, E. Beaudrey and Cie, Ingenieurs Constructeurs, Paris, France

Keywords : Filtering, Mesh, Traveling band screens, Thru flow band screens, Dual flow band screens, Drum screens, Microstrainers

Contents

Summary

The operational reliability of seawater desalination plants as well as that of large

industrial plants or power stations using seawater for cooling purposes depends entirely on the reliability of the pumping station. One important part of the pumping station is the filtering equipment and the choice of the type of filter. The combination of the intake structure and the pumps is a major point to obtain the best operational reliability. This paper is a guideline for seawater filtering plant design and layout.

1. Introduction

1.1. Definition of Filtering

It is a process which separates solids from liquids, it has two purposes:

- To clean the liquid
- To recuperate the solid matter

1.2. General Rules

The location of a filtering station determines its debris. There will usually be a combination of natural and man-made elements but it is difficult to estimate the amounts and cycles of the trash. Therefore, conservative or even over-sizing should be the rule. Pit maintenance, when done by divers, can be very costly. Investing in gates can save not only time but also money.

Gathering as much information as possible, visiting neighbouring stations and recognizing existing problems in plant design will help in the design of the equipment required. Visiting operating designed and built equipment before making a choice between bids will aid the decision. The quality of design and construction shows up in service rather than on paper.

Once the equipment runs, keep the constructors informed about how the plant is operating so that they can assist in improving its performance and reducing its running costs. The original supplier of equipment is never at fault for problems which result from using makeshift, less expensive, spare parts from other sources.

By consulting with experienced manufacturers at an early stage, operators will benefit from knowledge and experience.

2. Information to be Gathered before Starting

2.1. Flow Rates

Always add a safety margin to flow rates as water flow tends to increase rather than decrease during the design period. In general, new pumps often do better than expected.

2.2. Levels

For low water levels, operating levels need to be ascertained very carefully. Various

losses of head are induced by the intake and other upstream features and have to be taken into account. Loss of head that occurs when the pumps start should be carefully assessed.

For high water levels the only extra elevation that might need to be added is that due to transient surges at the pump there will be accidental or normal stoppage.

2.3. Trash Content Assessment

Trash content assessment is, by far, the most delicate problem. Operational records of neighboring stations are the first thing to look up. They are good guidelines but not always reliable when plants are some distance apart or even if the figures are vague where trash quantities are concerned. Looking at the neighboring shores is the next thing to do. Local fishermen can also give useful tips. A diver can be sent to find out what the bottom looks like. Looking at the water itself is seldom an informative process although something valuable might be noticed. Renew all these inquiries regularly over one or more years if possible. All facts should be reported in the inquiry even if figures cannot be applied to what you have found.

2.4. Regulatory Constraints

Local and national sources should be studied to find which regulations might interfere with water intake design. These can generally be classified in four categories:

- Right of passage along the shore. Intake and building limitations.
- Navigation-related rules about location, levels, sizes and velocities. These are always binding.
- Environmental issues such as imposed mesh sizes, velocities, seasonal restrictions, fish protection devices, etc.
- Trash disposal regulations. Can trash be returned to its source and what must be done with it if not?
- While the first two categories concern the intake rather than the screens, the last two categories have a direct influence on screen selection. Provisions for future increased stringency of environmental and trash disposal regulations need to be considered.

2.5. Mesh Aperture Selection

The choice of mesh aperture might differ according to whether the size is imposed by a regulatory source or if it is just related to the downstream use of the water.

2.5.1. Bar Screen Spacing

Bar screen spacing is not in most cases subject to regulation. It is generally related to what needs to be protected downstream. If a mechanical screen is to be protected, the bar spacing is best chosen according to Figure 1, which establishes a relationship between screen mesh aperture size and bar spacing. This can be changed when special

local conditions warrant it.

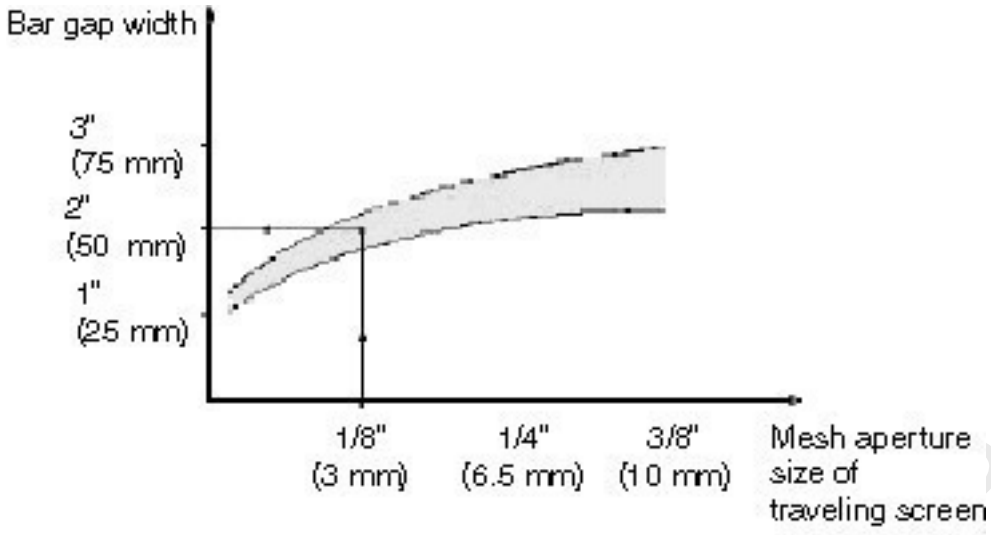

Figure 1. Bar spacing according to mesh of downstream mechanical screen.

-
-
-

Bibliography and Suggestions for further study

Boris Liberman, Mark Wilf (2005), Evolution of configuration of RO seawater desalination systems - IDA World Congress on Desalination and Water Reuse, Singapore.

Brett Andrews, Bhasker Dave, Paloma Lopes-Serrano, Shih-Perng Tsai, Rich Franks, Mark Wilf, Erineos Koutsakos(2007) - Effective Scale Control for Sea Water RO Operating at High pH and Temperature - Halkidiki Greece, EDS Conference

Eng.Aziz H.Gulamhusein, Eng.Ashraf Al Sheikh Khalil, Eng. Ibrahim A. Fatah, Roman Boda Dr.Stefan Rybar(2008) ,IMS SWRO Kindasa – Two Years of Operational Experience – EDS Conference Jordan

Gaudiot D (1993) Une théorie pour le dimensionnement des filtres d'eau de refroidissement, October. Paris: E Beaudrey and Cie.

Jackson P E (1988) *Beaudrey Microstraining*, September. Paris: E Beaudrey and Cie.

Mark Wilf (2007) The Guidebook to Membrane Desalination Technology; Desalination Publications

Paul Choules, Dr.Mourad Ben Boudinar, Bernie Mack (2009), Membrane Pre-treatment Design and Operational Experience From Three SWRO Plants – AMTA Conference – Austin, Texas

V.Bonnelye, L.Guey, J.Del Castillo (2008), UF/MF as RO pretreatment: real benefit; Desalination 222 , 59-65