

# **Defender Regenerative Media Filters**

**compared to**

## **High Rate Sand Filter Systems**

### **INTRODUCTION**

Neptune-Benson has been manufacturing filtration systems since 1956 serving markets including swimming pools, waterparks, aquariums & zoos and fountains. The majority of systems furnished to this recreational water industry have been sand filters constructed of a variety of materials. In the late 1950's, Neptune-Benson developed a line of vacuum diatomaceous earth (VDE) filters that grew in popularity until the high rate sand filter was introduced in the early 1960's. Many VDE systems remain in operation today, but the superior water quality benefits have been overshadowed by health and safety concerns. As we prepare to celebrate our 50<sup>th</sup> anniversary, our experience with DE filtration has shifted focus that has been brought about by the exploding growth of the indoor waterpark/hotel market.

Today, Neptune-Benson is pleased to offer the Defender Filter, a regenerative media filter, which offers the advantages of DE water quality without the handling and operational concerns. We are frequently asked to compare the features, functions and benefits of the Defender filter to the highly popular high rate sand filter. The differences fall into several categories including design, installation, operation, performance and cost.

### **DESIGN**

The major difference between high rate sand and Defender centers on the mode of filtration. High rate sand operates on the premise of depth filtration while the Defender operates on the premise of surface filtration. Both operate on a pressure principal. The sand filter is designed at approximately 12GPM/SF of filter area and collects dirt particles deep within the media bed. The Defender filter is designed at 1.2-1.4 GPM/SF and collects dirt particles on the media membrane surface. Note the vast difference in filter rate, which mandates nearly 10 times as much filter area. The design of the Defender filter incorporates hundreds of septa called "flex tubes" that generate dramatic filter area in a small space.

### **INSTALLATION**

The design of the Defender filter contributes to the space saving feature, which results in requiring  $\frac{1}{4}$ - $\frac{1}{6}$  of the space required for a similar capacity sand filter. The lesser operating weight of the Defender filter reduces the extent to which the floor slab must be engineered. In many cases, the Defender filter will replace 2, 3 or even 4 sand filters, which saves installation and rigging time. It should also be noted that the peripheral piping for the Defender filter is less extensive than a sand filter system.

## **OPERATION**

The operation of the systems differs primarily in the manner that backwashing takes place. Instead of reverse flushing a sand filter, the Defender filter actually discharges the used media and requires new media from time to time. The filter cycle of a sand system may range from 2-14 days or longer depending on the application, bather load and other design criteria. For a similarly engineered Defender filter with all criteria being equal, the filter cycle could be 21-60 days. This extended cycle can be attributed to the bumping feature of the regenerative Defender filter. This automatic mechanism shakes the dirt within the filter on a daily basis to reconstitute the filter media and start fresh. Eventually, the filter will become saturated with dirt necessitating the media replacement.

## **PERFORMANCE**

Performance narrows down to one issue, which is water quality. The Defender filter will remove particles down to 4-6 microns as compared to 10-12 microns with a sand filter. This actual sieving process depends on the size of the sand, filter bed depth and filter rate, however, the above guideline is generally accurate. Experienced pool operators may be able to recognize the difference in water quality with each system especially on deep-water pools or on heavily loaded pools. The Defender filter has the advantage of being able to handle the extreme dirt load of a heavily used pool on a regular basis.

## **COST**

The comparative cost depends on the size of the facility and the system flow rate. Defender systems can range anywhere from 2-3.5 times the cost of a sand filter from the standpoint of initial capital cost. This margin is quickly offset in operational and life cycle costs when adding in the expense for water, labor, energy, heat, chemicals and construction. The operation of the Defender filter virtually eliminates backwash water saving sewer costs and the associated costs of make-up water. Add in the savings related to space requirements, sand maintenance and replacement and the payback from a Defender filter could be as brief as one year.

## **MEDIA**

It is important to identify the fact that the Defender filter is designed to operate with all types of regenerative media. However, we recommend the use of Perlite as opposed to diatomaceous earth. This synthetic, non-crystalline product offers all the benefits of DE without any of the harmful risks. A more in depth study of media comparison can be found in our product presentation CD.

## **SUMMARY**

The Defender filter has been predominantly used on large volume systems or when access/space is a construction concern. Neptune-Benson has recently introduced the Defender2 model, which is a single size vessel designed to handle up to 600 GPM. The 27" tank diameter makes it a perfect selection for renovation projects or when space is at a premium. Defender2 is only marginally more than a sand filter system and offers all the advantages and benefits of the original Defender filter.