

Depth Clear D

Depth-Clear D is the combination of two proven Biotech products the Lenticular filter and the Bio-Process Container. The result is the first Lenticular filter system that is positively contained, and completely disposable. More importantly it is manufactured using Purolator LP's Cellulosic Depth media which has been used in the Bio-tech industry for over 15 years.

The Depth Clear D product line is scalable for 1 cell to 32 cells with single layer media and up to 26 cells with dual layer media. It uses Purolator's validated Pharmaceutical grade medias : KP, KPLE and KC medias. Micron rating range from 0.2um nominal to 20um nominal. Dual layer medias come in a combination of 10um/ 0.45 and 20um/ 0.6um. These two medias were developed to for exceptional throughput when filter high cell debris centrate and high protein solutions.

Depth Clear D can be purchased in two formats: Single inlet/single outlet, and Single inlet with a vent, and single outlet. Each application is different and the need for a vent can be assessed during trials. Depth-Clear D is a proven and reliable filtration system that is the most intuitive encapsulated depth media filtration system on the market.



Purolator LP: Depth Clear D and Single Use Technology

Richard Johnson.

"The biopharmaceutical market accounts for about 20% of the total market for pharmaceuticals but its share continues to increase because of the double-digit compound annual growth rates leading to projections that by 2014 eight of the top ten best-selling drugs will be biologics" (Bio Process International: May 2011, V9, #5 pg38). These drugs are antibiotics; vaccines; targeted therapies for genetic illnesses and cancer; and the next wave will be targeted viruses that will attack specific bacterial infections even as the bacteria themselves evolve to evade destruction. Viral therapy will replace antibiotics as they become ineffective due to overuse. All these therapies prevent and relieve immeasurable suffering and as such are the future of medicine.

Manufacturing sufficient quantities of a "Blockbuster" drug is the present challenge. The first step has been to improve the efficiency of up-stream processing. This has been manifested by increased cell density in fermentation and mammalian cell culture. The success of up-stream processing has been a nightmare for down-stream processing which is responsible for the clarification and purification of the proteins and polysaccharides which are the basis of modern bio-medicine. Recent Cell density increases upstream of 16 to 35 percent is common. This puts stress on filtration systems designed for much lighter production loads. In response new technologies are required.

"Selection of a supplier with the means and expertise to work in partnership with biomanufacturers to improve productivity and realize cost savings remains a key focus among customers" (Bio Process International May 2011, V9,#5, page 38) Purolator LP began working with Pfizer, at the time Wyeth, on their "Defined Media" project in 2007. Pfizer anticipated a shortage of the protein which made up the backbone of all their vaccines. PLP had been a supplier to Pfizer and their assistance was requested. The result of this collaboration was dual layer depth media modules. These were designed to Pfizer's requirements. These module were originally tested for a purification application but were than adopted into clarification. The advantage was that the dual layer modules could load 3 to 5 times the protein debris without blinding. At approximately the same time PLP was developing their Depth-Clear D disposable lenticular module.

"The end user community is not pushing for anything "outside the box"" so many new products or ideas cannot be tested." (Bio Pharm International May 2011 V9 Supplement 2, pg 10) Depth Clear D was disposable but familiar. It is the combination of two pharmaceutical staples: the depth media module and the bio-process container. Both very familiar, both reliable; the concept was easy to understand. In purification Pfizer captures their protein on the depth media modules and stores the modules with the protein, in the stainless steel housing, in a refrigerator until they need it. The protein is then eluted off. Bio-process containers are used for storage. It was the perfect fit for Pfizer. They could deposit their proteins onto the Depth Clear D modules. Then the modules could be removed from the housings in their support bags and hung in the refrigerator like a side of beef. Production at Pfizer got it immediately .

Disposable manufacturing also known as "Single use technology offers several advantages over traditional stainless steel manufacturing technologies; reduced capital expenditure, shortened engineering time and qualification timelines, and reduced

maintenance." (Bio-Pharm International: May 2011, V9, Supplement 2, pg 14). Capital spending expense is reduced by 60% and project time lines shorted by 30%. In Pfizer's case if the defined media project had failed, they would have had to build a new production facility which had a price tag in 2007 of \$12 million. By increasing cell density and improving downstream processing, they were able to avoid that cost. But more specifically, Pfizer will avoid validation costs associated with new filter vessels and piping. They will avoid the cost

and risk to technicians of moving large pieces of stainless steel without motorized assistance in the clean rooms. Pfizer avoids the cost of cleaning validations. They enjoy the benefits of an easily expandable filtration train which requires about 5 minutes of set up time and can be nearly completely evacuated of all product which is valued at about \$1000 per liter just out of the fermenter. The module is then disposed of.

Success in the Bio-Pharm market depends upon reliable products, consistent manufacturing methods, and a management group intellectually invested in Good Manufacturing Practices. It is a market that demands that process and procedures be followed not just to the letter of the SOP but to the spirit as well. " Filter manufacturers produce documentation to support their products by detailing methods used to make them and results of physical, chemical, biological, functional, and sterilization tests. Facility audits allow bio-manufacturers to assess the suitability of supplier's quality systems and associated documentation. Among procedures evaluated during such audits are filtration manufacturer's ability to ensure the quality of raw materials provided by its suppliers, a validated filter manufacturing process and the controlled release of filter products." (Bio Process International May 2011, Volume 9, Number 5 pg 40) Purolator LP will be audited by Pfizer after