

INDUSTRY INSIGHT

Pretreatment, Pretreatment, Pretreatment...

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Pretreatment rang out loud and clear as the predominant theme at Texas A&M's Annual 2005 Membrane & Separations Technology Short Course. At this recent event, Engineering Fluid Solutions, LLC (EFS) presented and demonstrated its patented HydraKleen liquid-solid separator.

This new separation technology advances pretreatment of industrial and municipal waters by offering a host of design features that improve operations, reduce maintenance and protect the environment. HydraKleen's bold new design embodies a fully packaged system comprised of pump, controller and stainless steel separation elements that collectively may be used as a separator and/or filter.

Nearly all presentations at the Texas A&M Membrane Short Course emphasized the importance of pretreatment in protecting membrane systems and further stressed the importance of addressing these pretreatment issues in the early design phases, basically urging short course attendees to deal with pretreatment as a forethought, rather than as an afterthought. HydraKleen's design was motivated and born out of recognition that, by and large, over the past 20 years, most research and development has focused on improvements in the very fine filtration spectrum as opposed to relatively coarse particle separation. Therefore, with the advent of new fine filtration technologies, the follow-on need for advancements in pretreatment for protecting/offloading fine filtration equipment is impending and urgent.

HydraKleen Design

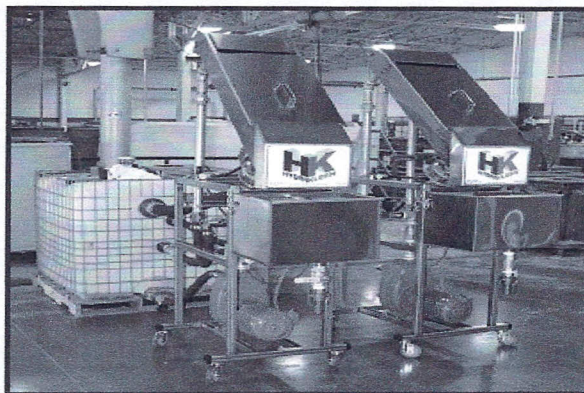
Recognizing this need, engineers at EFS embarked on the HydraKleen design. The design basically addressed efficiencies in operations and maintenance with an eye toward sustainable growth inherent in reuse and reclamation practices. Starting with a fresh perspective from a white sheet of paper, the engineers evaluated cost factors in operations, maintenance and environmental impact that include:

- water consumption
- chemical consumption
- waste treatment
- purchasing

- inventory
- administration
- consumable media
- disposal
- energy
- environmental burden
- quality
- opportunity costs.

Some of the most important design criteria were: automation, eliminating consumable media and ruggedness of design, thereby improving operations and reducing maintenance. In taking this design approach, it became evident to EFS engineers that actually, industrial goals were very much aligned to the goals of environmental protection, but just from a different perspective or motive. So in addition to the analytical and mechanical design details, the design team also addressed the more generalized issues of ultimately achieving the satisfaction of both industry and environmental protectionism.

The recent short course demonstration of the HydraKleen system nearly coincides with a formal product launch of the separator in January 2006. Short course attendees were able to get a sneak preview by viewing the HydraKleen in operation at the Texas Engineering Experiment Station (TEES) in College Station, TX. The demonstration revealed a new approach to liquid-solid separation that relies principally on gravity to achieve separation, thereby reducing energy costs of operation.



Hydrakleen system in normal run mode.

The HydraKleen uses a patented wedge-wire screen design that automatically rinses the screen using the process water, so the likes of auxiliary spray bars, mechanical vibration and brushes are not required for removing solids from the screen. In achieving screen rinsing in this unique way, human intervention is not required, so automation is preserved and maintenance is reduced over conventional screening methods; also, process liquid/water is not wasted as in conventional backflushing/backwashing type filters.

The design maximizes screen throughput, so the equipment footprint is minimized. HydraKleen systems may be used as separators for coarse particle separation and/or filters for removing fine particles. The unit covers a wide range of particle sizes and is not dependent on flowrate, pressure or other physical property requirements, so removal performance is consistent. HydraKleen systems are capable of removing particles nominally down to less than 10 micron and absolutely down to 50 micron.

The packaged unit comes fully assembled and is installed in less than a day; there are no specialty tools required in installation or assembly/disassembly. Units are available in excess of 2000-gpm capacity and may be custom-made. Available options are magnetic separation, oil-water separation and bactericidal control.

How it Works

The HydraKleen separator works in two basic modes: Normal Run Mode during most of the time, and Screen Rinse Mode for brief periods.

Normal Run Mode: During normal run mode, the HydraKleen pump delivers a solid-containing process liquid to an angularly disposed wedge-wire screen that separates the solid from the liquid; the liquid is sheared to the underside of the wedge-wire screen and the solids accumulate on top of the wedge-wire screen. In many applications, the accumulating solids slide down automatically off the wedge-wire screen under the influence of gravity; in other applications though, the solids may build up on the wedge-wire screen and not slide readily down. In these cases an automated screen rinse is effective in clearing the debris off the wedge-wire screen.

Screen Rinse Mode: For applications where automatic assistance is needed to remove the solids that build up on the top of the wedge-wire screen, the process liquid is periodically and temporarily redirected down the screen under a control signal that in turn rinses the solids down off the bottom of the screen. The rinsing liquid/water and solids may be collected in a finer filter basket hung within a sedimentation box and thereby

achieve further separation. The settling box allows sedimentation of solids before returning the screen rinsed process liquid back to the process. After completing the screen rinse mode, the unit automatically returns to normal run mode. The screen rinse mode is integrally tied into the oil-water separation option, so that with each screen rinse, insoluble oils are skimmed off and away. Also, optional magnets within the sedimentation box remove metal fines and swarf from the process liquid.

The HydraKleen design effectively removes a wide range of particle sizes from coarse material to settleable fines—in removing a wide range of particle sizes, the HydraKleen unit performs simultaneously as a separator and filter. The unit is easily converted from separator to filter and back within minutes. In designing any process stream, the fine filtration processes (i.e., membranes) often need prefiltration to operate successfully. Therefore, in considering membranes for a process, it is prudent to consider any required prefiltration/pretreatment simultaneously with the selection of membrane systems. Such an approach will save time, money, effort and also maintain credibility.

Filter elements within the HydraKleen separator are easily removed and replaced to evaluate the performance of alternative elements having different performance ratings; in this way, the optimal design and arrangement may be easily and affordably achieved. This feature is very useful when evaluating membrane systems, so selections of pretreatment alternatives can be done easily alongside the performance evaluation of the membranes.

HydraKleen screening systems are used in industrial, municipal and commercial pretreatment applications. Technical literature, website illustration and demonstration videos are available—to learn more on operation- and maintenance-related features of HydraKleen separation systems visit the EFS website at www.efsfilter.com.

HydraKleen pilot units and test units are available through Texas A&M University for performance evaluation by contacting Carl Vavra via phone at 979/845-2741 or by email at cjvavra@tamu.edu. You may also contact EFS directly at 303/478-7201 or by email at info@efsfilter.com; or alternatively contact the HydraKleen Texas representative, Advanced Fluid Systems (AFS) at 800/526-6369.

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