SpinTek Systems, Inc.

Innovative Rotary Crossflow System for Volume Reduction of Mixed Hazardous and Rad Waste

Technology Need:

The Department of Energy (DOE) has many nuclear weapons-related facilities requiring the separation of radioactive materials from a liquid waste or process stream to reduce the quantity of radioactive material for disposal. DOE is also interested in concentrating organic materials and in fractionating closely sized particles. Technologies are needed for radionuclide removal and concentration from waste streams.

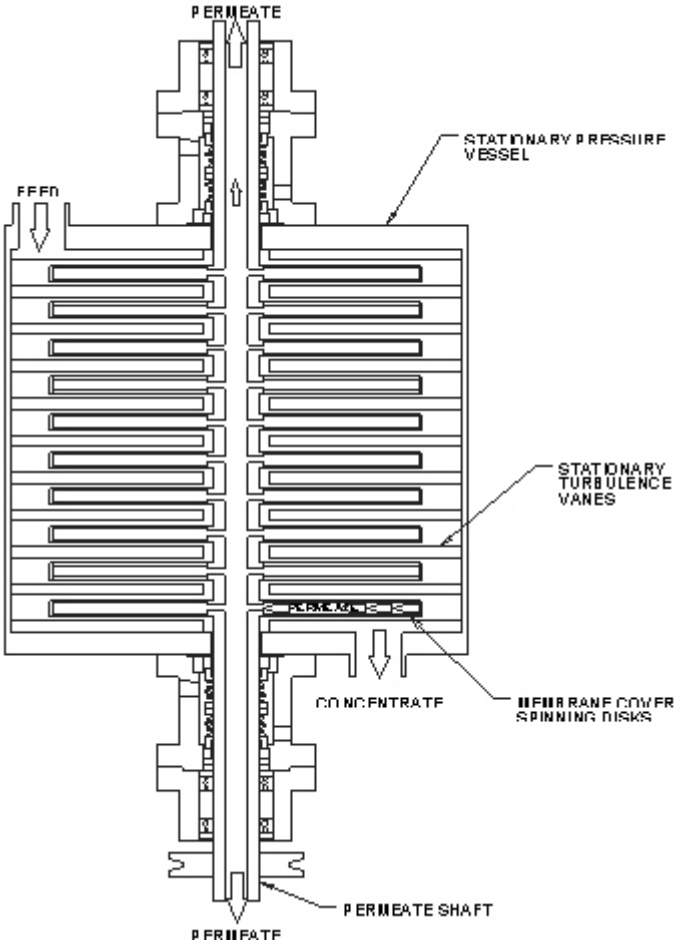
Technology Description:

SpinTek Systems, Inc. has developed a membrane separation technology that is able to 1) efficiently reject radioactive and other contaminants, 2) produce a permeate that is relatively free of radionuclides and other contaminants, and 3) reach large concentration factors while maintaining a high permeate flux.

The SpinTek ST-II High Shear Rotary Membrane Filtration System uses a series of flat, round membrane disks set on a hollow rotating shaft inside a cylindrical housing. The influent enters the membrane chamber under pressure and is distributed across the membrane surface. Permeate is forced through the membrane and is collected in the hollow shaft and is discharged. The concentrate exits at the edge of the membrane packs.

In conventional membrane systems, the buildup of rejected material at the membrane surface is reduced by recycling a large portion (approximately 98%) of the concentrate back to the membrane unit so that large liquid velocities are produced near the membrane surface. The large velocities increase turbulence which reduces the thickness of the solute boundary layer.

In the SpinTek ST-II High Shear Rotary Membrane Filtration System, the rotation of the membrane disks produces the turbulence required to effectively eliminate the solute boundary layer. In addition to the



SpinTek II High Shear Rotary Filter

rotational action, turbulence promoters ("wagon wheels") are located on each side of the membrane to prevent rotational flow (vortex formation) from occurring.

Maximum liquid velocities of about 15 ft/s are possible using conventional membrane systems, while the SpinTek ST-II system liquid velocities are typically 60 ft/s. As the waste is concentrated with treatment time, a conventional membrane system is not able to maintain the high cross-flow velocities because of the difficulty in pumping viscous material

at high flow rates. The SpinTek ST-II system does not rely on pumping to produce the required liquid velocities. Therefore, extremely concentrated wastes can be treated.

Benefits:

This technology is applicable to many DOE sites. Typical applications for SpinTek's system include:

- Processes requiring fine particle filtration without generating a secondary waste

- Applications where materials to be removed include colloidal, metal hydroxides, or other suspended solids

- Fractionation applications where it is desirable to separate components with differing particle sizes

- Operations where conventional membrane systems cannot operate without fouling

Status and Accomplishments:

SpinTek's system was deployed at the Radioactive Liquid Waste Treatment Facility at the LANL in April 1999. During the entire test run, the ST-II consistently removed the vast majority of the radioactive components in the waste stream. The ST-II demonstrated significantly higher permeate flux rates, fewer cleaning cycles, and significantly higher waste concentration factors than the separation devices currently in use at LANL.

In January 2001, SpinTek Systems, Inc. filed for Chapter 7 Bankruptcy. As a result, the SpinTek centrifugal ultrafiltration equipment was transferred to the University of Kentucky Center for Applied Energy Research to support a project developing a Fisher-Tropsch catalyst process by facilitating the separation of catalyst pellets from the waxy residue produced.

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Online Resources:

Office of Science and Technology, Technology Management System (TMS), Tech ID # 1449 http://ost.em.doe.gov/tms

The National Energy Technology Laboratory Internet address is http://www.netl.doe.gov

For more information on this and other technologies, please visit SpinTek's website at http://www.spintek.com