Application Note 3
Inerting System Prevents Plant Fires

A nitrogen based system minimizes danger during centrifugal separation

The danger of flash fires and explosions is inherent in many plant operations. Specifically, the combination of volatile solvents and dusts in process vessels such as high speed centrifuges can create highly flammable conditions. Unless proper safety steps are taken, this situation can lead to catastrophic fires and explosions.

These considerations led SmithKline Beecham to install an inert gas blanketing system on it's centrifuges at it's Guayama, P.R. pharmaceutical plant. A key component of the inerting system is automatic, continuous control of oxygen. This keeps the atmosphere in the process vessels below combustible levels, and prevents static charges, mechanical failures or other ignition sources from starting a fire. It also reduces the need for skilled supervision of the inerting process.

Many Ignition Sources:

Neutronics Inc. (Exton, PA) a process instrument manufacturer, has developed an Inerting Control System (ICS) for the problems encountered with vessels such as centrifuges which recover product from
solvent-laden streams. Because of their high speeds, centrifuges can generate corona discharges that can ignite flammable mixtures. In addition, centrifuges are susceptible to mechanical failure, such as bearings overheating or failing. SKB decided the best design principle to follow was to assume that ignition sources will always be present.>

With this assumption, the only other ingredients necessary for combustion are a fuel source and a sufficient amount of oxygen. Fuel sources commonly encountered cover a wide range of industrial solvents or dusts. The Minimum Oxygen Concentration (MOC) for some common solvents is shown on the linked table "MOC". The basic concept underlying the ICS is to keep the oxygen concentration below the MOC.

Inerting systems are not new; there are two traditional approaches: One is the so called timed-volume or continuous-purge operation in which the vessel is flushed with inert gas initially, followed by a flow of inert gas which assumes that conditions will be maintained below the MOC. The other is pressurized operation, in which the vessel is flushed, and then a positive pressure is maintained within the vessel using the inerting gas. Neither of these methods measures oxygen content directly, and both are wasteful of inert gas. This can easily become very expensive when a plant is required to collect and treat volatile organic compound (VOC) emissions.

Reduced Gas Consumption:

The ICS chosen by SKB continuously measures oxygen concentration, adding inert gas only when necessary to maintain the concentration below the combustion point.
Upon startup of the ICS in 1987, SKB quickly identified many leaks in centrifuges, preventing them from operating. In some cases, the leaks appeared only after the unit came up to operating speed and developed a slight vacuum - a leak of this sort would never be identified without oxygen monitoring. Once the leaks were attended to, the ICS performed efficiently and reliably, while keeping VOC emissions at a minimum. In addition to direct control of the centrifuges, it passed a 4-20mA signal to the plant wide distributed control system (DCS), so that operators in the control room can monitor the operating conditions of each protected centrifuge. SKB is very pleased with the low maintenance requirements and performance of the ICS, and has ordered additional units.

There are over 5,000 ICS installations on a wide variety of flammable processes, including: centrifuges, fluidized bed dryers, reactors, feed, wash and storage vessels. Any process that currently uses large volumes of inert gas for blanketing for safety or process reasons can benefit from the increased safety, reduced gas consumption, and VOC reductions that the system