HOW A HOSPITAL MADE THEIR CELL THERAPY CRYO-STORAGE SYSTEM MORE EFFICIENT

OBJECTIVES

To help advance cell therapy and cancer research at a leading research hospital by solving space-related issues and constraints due to cryostorage labs on upper floors, making traditional bulk liquid nitrogen systems impractical. The hospital uses liquid nitrogen Dewar vessels connected to a manifold that enables a continuous liquid nitrogen supply required by a Cryobank. The manifolds had issues with unequal liquid nitrogen distribution and the inability to accurately monitor the liquid nitrogen tanks.

CHALLENGES

Faced with a higher demand for clinical research in cell therapy, the hospital employed a new procedure involving harvesting and shipping of a patient's blood cell samples to the cell therapy manufacturer. The manufacturer then separates out targeted cells from the blood sample and genetically modify these cell with receptors that identify and bond with cancer cells.   The genetically modified cells are then extracted after incubating. Following this procedure, the technician freezes and ships the samples back to the hospital. Finally, after receiving the genetically modified samples, the hospital injects a small portion of the cells into the patient. These injected cells have the ability to identify and kill the patient's cancer cells.

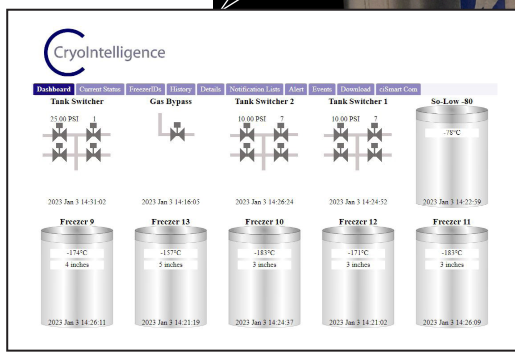
As for the remaining cell samples, those are stored and kept cryogenically frozen for possible future use with the patient. This recent trend in cell therapy required the hospital to expand its biobanking capacity. The FDA requires that these therapies be maintained at a temperature below -150°C while in storage. To meet FDA requirements, the hospital must be able to track and maintain accurate records on all of the freezers in the biobank. To meet this requirement, this hospital purchased a system of temperature probes that put all of the freezer temperature results in the cloud, and would provide alerts to relevant staff if any freezer went above the -150°C threshold.

MATHESON SOLUTION

MATHESON'S team worked with the hospital by conducting a site survey to better understand the procedures for cell therapy and monitoring, as well as replacing the liquid nitrogen manifold. After meeting with hospital staff and creating a plan, they provided the hospital with a Pacer Digital Universal Tank Switcher with a fully automated manifold. The Universal Tank Switcher interacts with multiple Dewars, an insulated container storing liquid nitrogen. This switcher allows liquid nitrogen to be pulled from one Dewar at a time, then switched to the next Dewar once it is emptied thereby ensuring a continuous supply. The universal tank switcher has a sensor in its manifold that detects liquid nitrogen. Once the tank switcher no longer detects liquid nitrogen, it will switch to the next supply tank in the sequence and denote the supply Dewar as empty.

The manifold system previously used by the hospital allowed the liquid nitrogen system to pull from any Dewar at any time. Only the Dewar with the highest pressure was utilized, making it very difficult to remove all the liquid nitrogen from the supply Dewar. Using only one Dewar at a time now allows the hospital to have better control and understanding of the amount of liquid nitrogen available, rather than having to do guesswork or estimations. This allowed the hospital to know how much liquid nitrogen was available at any time and which tanks needed to be refilled.

Incorporating the new system has helped ensure the cell therapy process performs more efficiently, provides remote access, and allows employees to connect the universal tank switcher to the Ethernet, thus putting all the information from the switcher into a cloud system for better oversight. The cloud-based system allows for continuous remote monitoring of the temperature and nitrogen levels in each of the freezers. Previously, temperature monitoring was available, however, the problem was that by the time the temperature started to increase in the freezer, the liquid nitrogen levels had dropped, and temperatures would rise above acceptable thresholds quickly.



The more efficient system MATHESON has provided working with Pacer Digital Systems, Inc. now remotely monitors the freezer liquid nitrogen levels and temperature and sends alerts at the first indication of an issue. These alerts give lab technicians time to take corrective actions before the freezer has a temperature excursion. Additionally, the system assists the hospital in controlling liquid nitrogen distribution to the freezers. The universal tank switch has a one-fill-all-fill distribution model. The system will fill all the freezers if one freezer calls for a fill.

The old manifold system would fill each freezer whenever it demanded nitrogen. This process was inefficient because every time a freezer is filled, the line has to be chilled to cryogenic temperatures. Chilling the line consumes a significant amount of nitrogen. At this hospital, a hot gas bypass was installed at the end of the line allowing nitrogen gas consumed by the cooling of the pipes to be evacuated. Once liquid nitrogen is detected at the gas bypass, the valve then closes and the freezers begin to fill with liquid nitrogen. This occurs every three to four days, compared with the previously less efficient system where piping was cooled several times a day. This new system reduced the amount of liquid nitrogen consumption by 30%.

MATHESON's solution to the freezer system benefits not only the cell therapy lab and hospital, but delivery drivers as well. Previously, drivers were required to visit the hospital to remove and replace tanks on a much more frequent schedule. MATHESON's contributions allowed for a new delivery schedule based on what tanks needed to be changed. This decreases the driver's workload and creates a more efficient and environmentally responsible system. Decreasing the number of trips a driver makes to the hospital ultimately helped to increase sustainability by reducing the driver's carbon footprint, as fewer visits to the hospital equates to a decrease in CO_2 emissions and increased fuel economy.

Contact the MATHESON Cryogenic Team today!
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