

Performance and Reliability for Key Irish Facility

Seeking improved performance and reliability from their extensive pilot plant in Fermoy, Moorepark Technology Ltd. chose Rota Val to supply a custom-designed new rotary valve for their Spray Drier.

Moorepark Technology Ltd. (MTL) is a subsidiary of Teagasc, the Irish Agriculture and Food Development Authority, and jointly-owned along with a consortium of major Irish food manufacturers. This combination of private and public ownership provides financial support and research resources to maintain a highly efficient and very well-equipped pilot plant specially designed to test out new production processes for the international food industry.

The plant is large enough to accurately simulate commercial food processing. It has been designed and built specifically for research, development and pre-commercial scale manufacturing in areas such as dairy products, cultured milk products, dried food ingredients, confectionery, beverages, sauces, dressing and dips, yellow fat spreads and margarines and bioprocessing including protein separation, fermentation and enzymatic conversion.

MTL's plant consists of six self-contained, but interlinked, operating units. These include the cheesemaking unit, a separation technology facility, a wet process unit, fat technology unit, evaporation and drying, and the food technology applications unit. Offering the highest standards of completely confidential development and research work, MTL has established a reputation for high quality procedures, excellent documentation and valuable input from experienced staff.

Reliable results and a commitment to excellence are revealed in that MTL has gained regular business from around 120 manufacturers worldwide, with a growing customer base outside Ireland. However, consistently high standards demand continuous assessment and upgrading of plant systems to meet the needs of rapidly developing new food production technologies. The MTL plant, which is located at Fermoy in Co. Cork, would normally use each of its self-contained operating units in a progressive sequence to establish the best processing technology for customer requirements, which naturally means that any key individual component becomes critical to the overall performance of the pilot plant.

One area to be considered for upgrading was the evaporation and spray drying complex. Dr. Sean Tuohy, General Manager of MTL, commented: "We became concerned that the performance of a component of our spray drying plant was deteriorating and reaching a point where it would no longer operate to an acceptable standard. A rotary valve installed in the lean phase conveying system had been subjected to unusual and extreme conditions, and was beginning to cause problems. The valve controlled material flow from the fines recovery cyclone into a 50mm pneumatic conveying pipe and had become unreliable with substantial leakage and frequent pipe blockages."

Rotary valves are normally specified according to the type of material to be handled, their abrasive characteristics, throughput and conveying density. In this application, MTL had no definitive data because the material to be conveyed could be anything from fine, dry powder to sticky, fatty materials and the particle size could vary considerably.

"Our need was for a valve that could handle an unusually wide range of materials," commented Dr. Tuohy. "In a normal production environment, the valve would be handling a consistent range of materials with well-defined characteristics. It would be cleaned down at regular, but not necessarily frequent, intervals, and would be subject to standard maintenance procedures. In our case, none of this applied. The need to supply a reliable service to our business partners, to provide a wide range of pilot plant facilities, and to meet modern commercial pressures imposed a regime of frequent product changes, consequent clean in place procedures, and also full strip down and clean "out of place" activities at frequent intervals. Compared to the stresses imposed upon a commercial rotary valve, our processes must represent a significant acceleration of normal industrial wear characteristics."

"When considering the need to replace the original rotary valve, we looked at the problems we had with the existing installation. These included excessive product escape through worn seals, and a build up of material and blockages in a diverter valve about 3 metres downline from the rotary valve. Our key requirements were for greater reliability, enhanced performance, fast Clean-In-Place features, wider product handling capabilities, longer service life and better product containment to meet environmental regulations. All of this, however, had to be achieved in an environment where the valve would be cleaned frequently, potentially leading to

excessive wear, and the materials handled would exhibit a very wide range of flow and bulk density characteristics”

“We prepared an outline specification for the replacement valve and asked a number of suppliers to quote for the work,” said Dr. Tuohy. “However, only one company was able to guarantee the design, development and performance of a suitable CIP-able rotary valve which would meet our unusual requirements. That company, Rota Val Ltd., demonstrated considerable previous experience in the production of customised rotary valves using existing products as a base.”

Rota Val Managing Director, Ian Blackmore, takes up the story. “When we examined the system, we discovered that the throughput required was very small, consequently the system had been designed around a conveying line of only two inches diameter whereas the outlet of the cyclone and therefore the inlet of the rotary valve needed to be 250 mm diameter to prevent bridging when handling the more difficult products.”

“Originally it was expected that, as the throughput was to be controlled by the feed into the cyclone, the only function of the rotary valve was to act as an airlock. Consequently a standard blowing seal valve supplied by others had been incorporated: this had a discharge port size of 100 mm requiring a taper adaptor to reduce down to the 50 millimetre conveying line. The blowing seal configuration was out of balance for the needs of the system as a whole; principally the large rotor (300mm dia) and 100mm entrainment trough presented such a large cross sectional area that the 50mm conveying line velocity was well below that needed to ensure good and consistent product entrainment. There was a tendency for high-fat products to stick within the rotor and not be swept clear by the conveying air until such time as the air velocity had increased to a point where pick-up occurred, when the product tended to break away in lumps giving rise to the blockages experienced.”

Having identified the principle cause of the conveying problem, Rota Val then considered the additional features required by MTL. Although several standard types of rotary valve offered partial solutions, discussions between Rota Val and MTL quickly established that a customised valve would give the best results.

Accordingly, Rota Val developed a hybrid valve incorporating the best features of the established 'Fast-Clean' valve design along with some of the unique features of the 'Hypergienic' range normally supplied to the pharmaceutical industry.

The final result was a wholly fabricated stainless steel assembly incorporating a reduced capacity 250mm rotor with scalloped pockets; the overall design reducing the entrainment cross sectional area by some 75%. The valve included 50mm pipe connections providing direct purging of the rotor pockets. These features ensured that the pick-up velocity is always sufficient and directed to provide reliable and uniform entrainment with even product distribution in the valve and pipe system. Rota Val designed and manufactured the new valve specifically to replace the original unit without modification to existing plant.

Now installed and working hard for two years, the valve has earned respect for its ability to cope with continuous operation, frequent strip-downs and conveying an unusually wide range of products. "Rota Val worked closely with us over a period of some three months to develop this valve," commented Dr. Tuohy. "We found them to be eager and enthusiastic to find the best solution to our needs, with a considerable body of experience in their specialist field. The end result is a rotary valve that has met our performance requirements. The clean-in-place features save a great deal of time, while the valve is also easy to fully strip down when that is required. If we did the exercise again, I don't think I would make any significant design changes or improvements. Rota Val has designed and manufactured an excellent solution to our needs which met all of our original objectives."

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