

# DMN VALVES – CLEAN WINNERS

Cleanliness is next to Godliness and nowhere is this more true than in sanitary components for the pharmaceutical, high end food, dairy and cosmetics industries.

Ever increasing demands are being placed on installations in these sectors, to meet stringent hygienic standards with a minimum of disruption to production. In the United States, whenever there are strict requirements the 3A guidelines generally apply to wet processes and the USDA (United States Department of Agriculture) guidelines apply to dry processes as far as rotary valves and diverter valves for the dry bulk solids handling industry are concerned. In Europe the EHEDG is a similar organisation consisting of a consortium of equipment manufacturers, food industries, research institutes, and public health authorities, founded in 1989 to promote hygiene during the processing and packing of food products. The EHEDG feeds information into the CEN, which is the European committee for voluntary harmonisation within the EEC. In the case of dry bulk solids handling, approval of components by either the USDA or the EHEDG brings a degree of assurance to both plant builders and end users alike.

DMN-WESTINGHOUSE have a range of rotary valves and diverter valves whose design has long been approved by the USDA. Components used within the EEC must also comply with other European legislation such as the "CE" directive for safety, the pressure equipment directive "PED" and the atmosphere explosive directive "ATEX" where required.

## Sanitary Rotary Valves

The basic construction of a sanitary rotary valve is very simple. It consists of a body, two end covers, a rotor, shaft sealing and a drive. Generally the body and end covers are cast, with the rotors being fabricated. Precision machining of all components is critical, as the number and clearance of the blades when assembled determines the leakage and efficiency of the rotary valve. The design should be easily demountable without tools, and all product contact surfaces should be polished to at least  $<0.8 \mu\text{m Ra}$  (150 grit).

There is an increasing demand for components with CIP capabilities which, depending on the application, can be difficult to realize. For example the cleaning, sterilising and drying of the shaft seal arrangement as part of the CIP cycle and then being absolutely sure that the process went as planned. Another point to consider is the requirement for tight clearances when the valve is operating at say ambient, and the CIP cycle where the CIP fluid is  $100^{\circ}\text{C}$ . If the fluid hits the rotor at this temperature it will cause rapid expansion of the rotor with much slower expansion of the casing, resulting in tighter clearances between rotor and casing which could result in binding.

## General applications for rotary valves

### Feeder (no pressure)

The purpose in this application is to regulate

the continuous flow of dry solids from one place to another. In this case differential pressure or air loss is not taken into consideration. Normally for these applications a simple construction will suffice. Typical applications would be under a bin, feeding a belt or screw conveyor, or a non-critical blending operation.

### Airlock feeder (positive pressure)

The purpose of this feeder being to minimize the air or gas flow between places of unequal pressure, whilst allowing a continuous flow of dry solids from one place to another. There are four major factors that will affect air loss through a rotary valve. They are: the pressure differential between the inlet and outlet of the rotary valve, the amount of clearance between the rotor, the housing bore and the end plates, the size of the rotary valve and the number of blades on the rotor. Problems caused by excessive air loss through the rotary valve are reduced volumetric efficiency and excessive wear.

### Vacuum feeder (negative pressure)

The vacuum feeder function is similar to the feeder function, except that the rotary valve is expected to regulate the flow into a vacuum system. Generally air loss will be minimal because the differential pressure will be in the same direction as the flow of the bulk material. The volumetric efficiency will be excellent as the differential pressure in the system will be in the same direction as product flow.

Typical applications would be under a bin or bulk storage tank metering material into a vacuum system

### Pneumatic conveying (negative + positive)

See airlock feeder (positive pressure) and Vacuum feeder above.

### Metering

Typical application would be evenly feeding a mill or sifter

### Dosing

Reasonably accurate batches can be obtained with reduced capacity valves.

### Protective Equipment (ATEX approved)

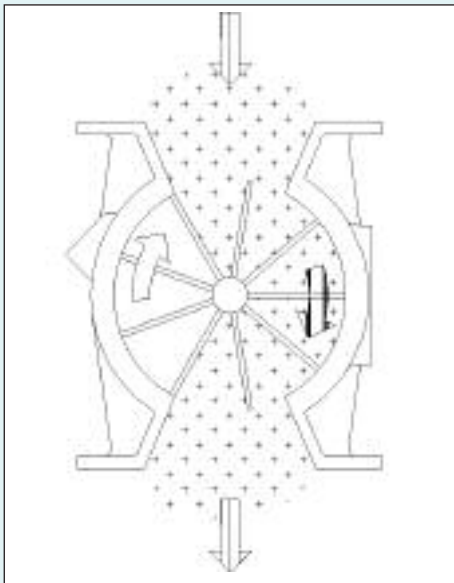
All DMN-WESTINGHOUSE valves are 10 bar explosion proof, and a large percentage can also be supplied flameproof in the event of an explosion up to 10 bar. Flameproof means that the construction of the valve will stop flame passage by an explosion up to 10 bar passing from one side of the valve to the other.

### Material & Design

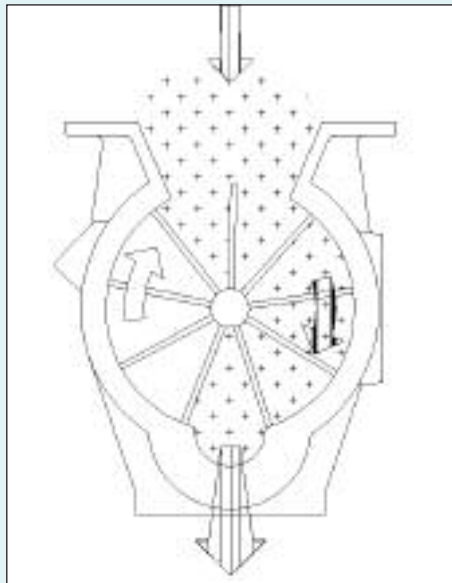
All materials to be used must be non-toxic and non absorbent. The product contact surfaces must contain no crevices or pin holes and the surface finish must be  $< 0.8 \mu\text{m Ra}$  or better. Generally stainless steel types AISI 304 and AISI 316 are acceptable for castings and AISI 316L is



DMN valves offer super hygiene for the food, pharmaceutical, dairy and cosmetics industries



AL valves: the product is fed by gravity through a pipe at the bottom of the valve



BL valves: the product is transported from top to bottom

used for the fabrication of rotors. Valves have also been manufactured from ferro magnetic stainless steel ASTM A890 Grade 4A-UNS J92205 and ASTM S31803, these materials are duplex stainless steels which means ferritic-austenitic stainless steels. The main reason for the use of this material is its magnetism, which enables it to be detected and therefore removed if it should contaminate the product being conveyed. All plastics, elastomers and lubricants that could come into contact with the product should be FDA food grade approved materials.

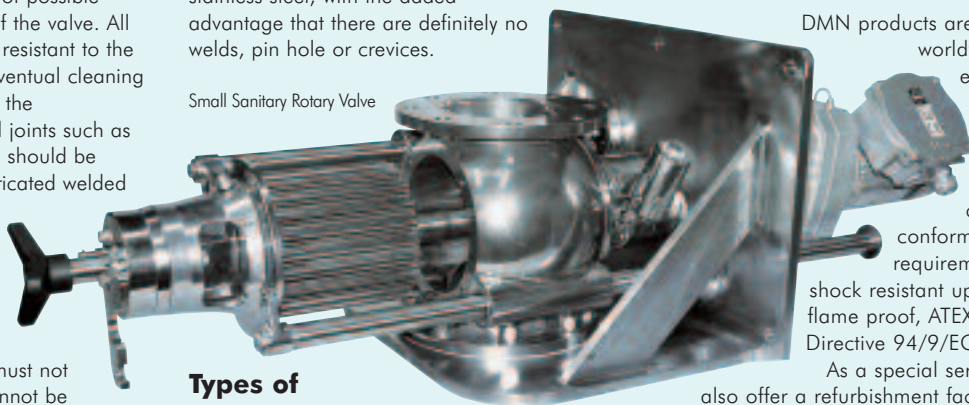
Design should incorporate easy access and cleanability as well as prevention of possible contamination from the exterior of the valve. All product contact surfaces must be resistant to the product being handled and the eventual cleaning agent used to disinfect or sanitise the component. Direct metal to metal joints such as screw threads and mating flanges should be avoided with the exclusion of fabricated welded parts such as the rotor. Internal sharp corners must be avoided and preferably have a radius larger than 3 mm (the larger the better). If sharp corners cannot be avoided, cleanability must not be impaired. Gaskets and seals must not create crevices or voids. If this cannot be avoided then again cleanability must not be impaired. O-rings should not be used unless absolutely necessary. Areas in the design where product could accumulate must be avoided. Design should be self-draining to ensure that no cleaning agent remains on the inside of the valve after the cleaning cycle, making it easier to dry the valve. It is also preferable to design the exterior of the valve so that all liquids drain off.

## Types of rotary valves available

DMN have ten types of rotary valve of which two have USDA approval for the design: the drop through "AL", and blow through "BL". Both these valves are available in two easily detachable versions, one with supporting rails. All product contact parts are in food grade materials, rotor pockets are radiused and

polished, rotor vanes are chamfered on all three sides and explosion shock resistance and flameproof models are available. There is also a range of valves with oversized inlets for applications where inlet size is more important than capacity due to the danger of bridging. When a direct drive is fitted to these valves the safety, maintenance and hygienic nature of these valves is enhanced as there is no chain needing adjustment, lubricating or covering. Varying the speed of a direct drive is also very easy, as inexpensive frequency inverters are readily available. There is also the sanitary SAL range of small valves available manufactured from solid stainless steel, with the added advantage that there are definitely no welds, pin hole or crevices.

Small Sanitary Rotary Valve



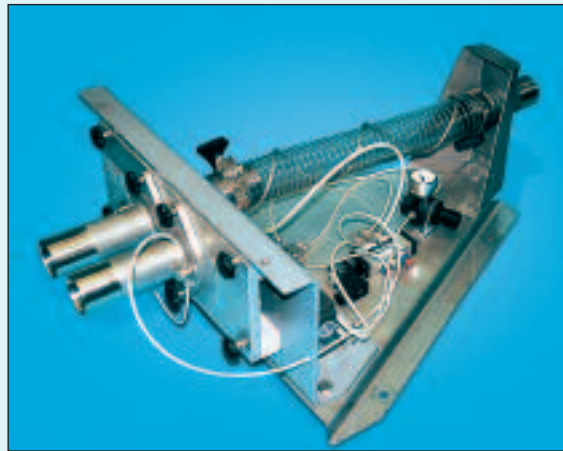
## Types of diverter valves available

Besides the Rotary Valves, DMN have eight types of diverter valve of which the tube type diverter (TDV) has USDA approval. This diverter has smooth contact surfaces, inflatable seals and an easily demountable construction. (tdv.jpg) The multi-port diverter (M-TDV) is also a sanitary diverter available with up to 20 diverging or converging ports. There is also an easily detachable sanitary gravity plug diverter (GPD) available in 4 different sizes. (gpd.jpg)

DMN-WESTINGHOUSE have been designing and manufacturing rotary valves, diverter valves and other related components for the bulk solids industry for more than 30 years. Offering tailor made solutions for the mineral, chemical, food, plastics and pharmaceutical industries,



GPD Gravity Plug Diverter



TDV Tube Type Diverter

DMN products are distributed worldwide. Besides an extensive range of standard components, they also supply components conforming to USDA requirements, pressure shock resistant up to 10 bar, flame proof, ATEX compliant to Directive 94/9/EC, etc.

As a special service DMN UK also offer a refurbishment facility for its valves and can return worn equipment to original manufacture specifications. All refurbished equipment carries the same comprehensive warranty and back up service as the new valves.

For full details of the extensive range of rotary, diverter and slide valves offered by DMN or to discuss a specific application, call the DMN UK sales team on +44 (0)1249 818400 or e-mail them on [dmn@dmnuk.com](mailto:dmn@dmnuk.com). Alternatively, visit the DMN web site at [www.dmn.info](http://www.dmn.info).