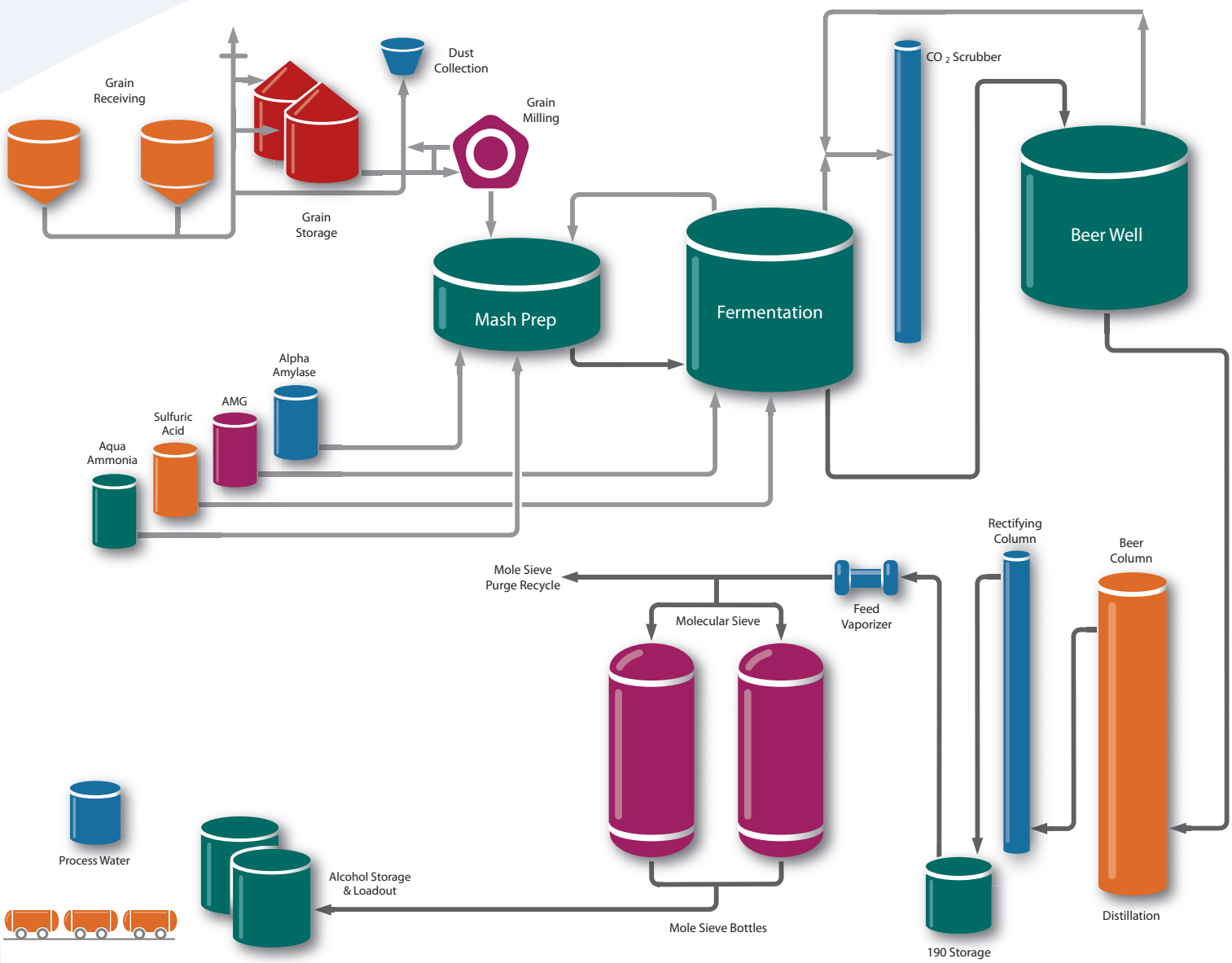
Valve Solutions For Ethanol Production

metso automation

Valve Package Solutions:

For Every Stage Of The Ethanol Process

Over Four Billion Gallons Served And Counting. More ethanol flows through Metso Automation's JAMESBURY® and NELES® valves than any other brand. Metso Automation has been at the forefront of developing cost-effective valve package solutions for every stage of the ethanol process from mash preparation to transportation. Best-in-class JAMESBURY and NELES valves make a difference in delivering dependable, high life-cycle performance and consistent end product quality. No wonder nearly two out of three ethanol plants prefer our valves. Metso Automation valves for ethanol production. **Intelligent Reliability. Intelligent Choice.**



Reliable Control Performance Where It Matters Most.

Mash Preparation
Corn kernel is ground into 'meal' and processed without separating the components. It is then slurried with water to form a 'mash.' Added enzymes convert the starch into simple sugar. Then ammonia is added for pH control and as a yeast nutrient. The mash is processed at high-temperatures to reduce bacteria levels prior to fermentation and then cooled.

Fermentation
Mash is transferred to fermenters where yeast is added and the conversion of sugar to ethanol and carbon dioxide (CO_2) begins. This stage takes 40-50 hours. The mash is agitated and kept cool to facilitate yeast activity.

Distillation
The resulting 'beer' is pumped to distillation columns where the ethanol is separated from the remaining 'stillage' and concentrated to 190 proof. Distillation is unable to remove the remaining water because it has bonded with the alcohol.

Molecular Sieve Drying
The last 5% of water must be removed. The separation is done at the molecular level, dehydrating the 190 proof ethanol in a molecular sieve system. The 200 proof product is then pumped to the tank farm.

Ethanol Storage & Other Processes
The anhydrous ethanol is made undrinkable by blending it with about 5% denaturant (like natural gasoline) to avoid beverage alcohol tax. It is now ready for storage and shipment.

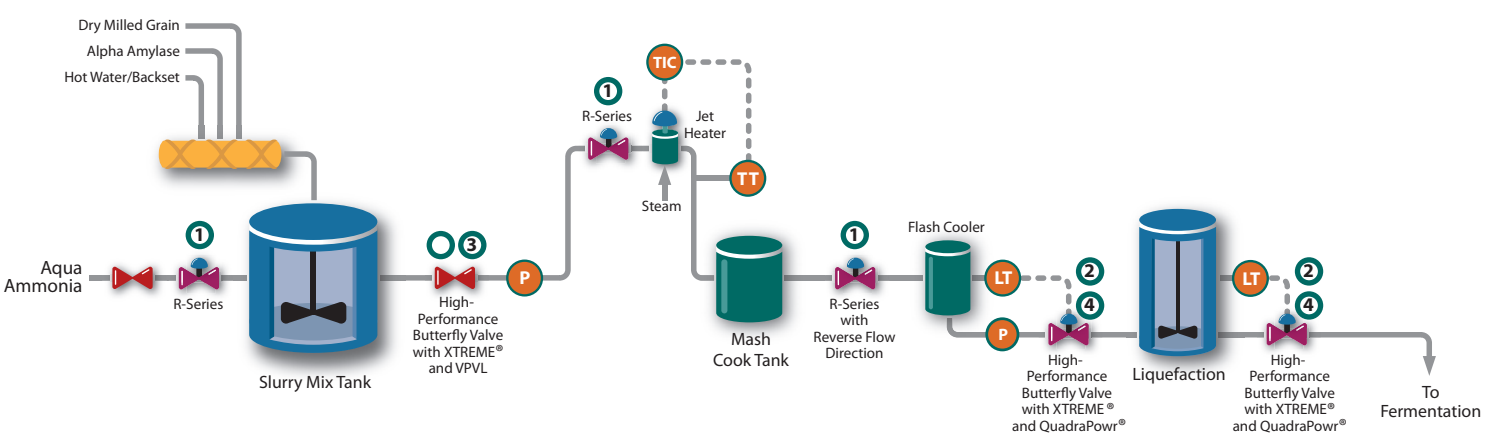
Production Of Fuel Ethanol.

The creation of ethanol is little more than the biological conversion of corn starch. The conditions required for ethanol production are relatively moderate compared to similar processes. While there are no extremes of temperature or pressure, there are unique challenges that make selection of the right valve critical. At every step of the process, best-in-class products from Metso Automation help you improve production while reducing downtime.

The Mash Preparation Process:

Controlling Erosion, Leakage & Noise

The initial processes in the production of fuel ethanol, involving the grinding of corn kernels and cooking mash, have several potential pitfalls. Metso Automation allows you to mitigate many of the problems that can occur, such as erosion, control, leakage, and noise reduction. R-Series control valves positioned in the reverse flow direction, minimize the erosive effects of flashing fluid. Equipped with metal seats and hardened trim, the high velocity fluid is directed downstream of the valve body, thus protecting the valve internals. Metso Automation valves can also help curb the costly leakage problems at the pump isolation valves. And when installed with complementary automation and control products, Metso Automation valves provide the ultimate in reliability.



1 **R-Series Control Valves with Low Cv Trim**
These special trims are designed for high accuracy control at low flow conditions. With four low Cv trim sizes available, the R-Series can be specifically sized to provide high resolution control performance.

2 **WAFER-SPHERE® High-Performance Butterfly Valves**
These valves offer special off-center discs with proprietary seat designs and unique XTREME® sealing technology that make them ideally suited for ethanol production processes.

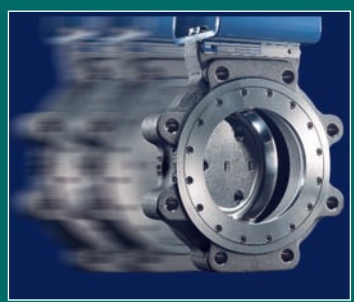
3 **Series VPVL Actuators**
VPVL double-opposed piston actuators are popular selections for this stage of the ethanol process because of their durable space-saving construction and affordability.

4 **QuadraPowr® Actuators**
The QuadraPowr® X spring-diaphragm actuator is a unique solution that provides exceptionally smooth and reliable actuation for 90° rotary valves. It combines the low air pressure requirements of a diaphragm actuator with the high pressure capacity of a piston actuator. The result is a smoother, more accurate operation.

Series 3A/3C Ball Valves
A 3-piece threaded or socket-weld body design can be used up to the full body rating of 1000 psi (69 bar). Seat material options mean it can handle most common fluids up to full body rating. Extremely versatile valves, they are used in various places along the line in all ethanol production processes.

StoneL® QUARTZ® Switches
This advanced automation system combines Metso Automation's actuator experience with StoneL® advanced communication and control system technology to form a totally compact, integrated automation package. It dramatically simplifies, and reduces the cost of, automation rotary on/off valves by eliminating the need to engineer and procure a range of accessories that would otherwise have to be obtained separately.

Going To Extremes.

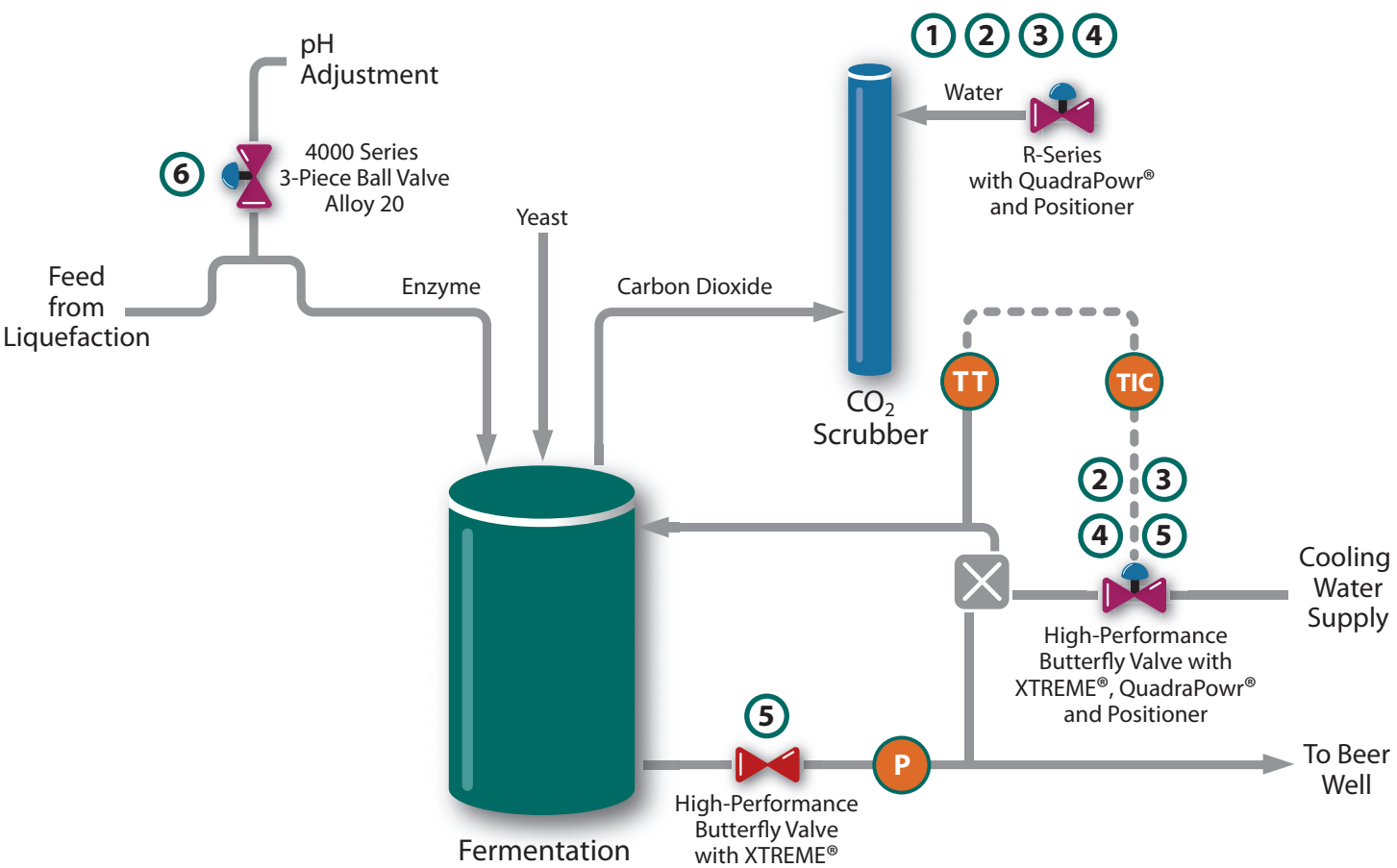


In ethanol processing applications where spikes in temperature are common, it is critically important for the valve seat to provide leak-free performance for lengthy periods. To that goal, we offer a range of valves with the XTREME® seat made of an engineered fluorocarbon polymer. The XTREME® seat material broadens the range of temperature and pressure applications to extend from -420° to 500° F. Its durability and low torque characteristics have performed well in severe ethanol processing applications. The ability to stock valves with one seat material for a number of applications also reduces the plant's inventory levels and increases safety by reducing the potential for misapplication of replacement seats.

The Fermentation Process:

Optimizing Blending & Contamination Control

Fermentation tanks are where yeast converts glucose to ethanol. One thing you can't afford here is a leaky valve that leads to poor blending control, sub-adequate cleaning and wasted caustic. If the contamination is not properly controlled, bacteria can create unwanted organic acids. These acids lower 'beer' yield as well as create other problems. Correcting this situation can be as simple as installing reliable Metso Automation valves that are cleaned as part of the CIP process.



1 **R-Series Control Valves with QuadraPowr®**
The economical R-Series rotary segmented ball valves deliver outstanding control performance and superior, long-lasting tightness. Coupled with a QuadraPowr® actuator, it provides smooth and reliable valve actuation.

2 **QuadraPowr® Actuators**
The QuadraPowr® X spring-diaphragm actuator is a unique solution that provides exceptionally smooth and reliable actuation for 90° rotary valves. It combines the low air pressure requirements of a diaphragm actuator with the high pressure capacity of a piston actuator. The result is a smoother, more accurate operation.

3 **ND9000 Digital Valve Controller**
Designed to operate on virtually any valve actuator, it ensures the highest possible end product quality in all operation conditions with unique diagnostics and incomparable accuracy. In addition to the general purpose unit, the ND9000 is available in a flame proof enclosure for use in hazardous areas The flame proof version of the ND9000 is available with a variety of industry standardized certifications and approvals. These approvals meet a wide variety of hazardous area requirements, for complete application details and hazardous area classifications, refer to the ND9000 product bulletin.

4 **NE700 & NP700 Positioners**
NP700 pneumatic and NE700 electro-pneumatic positioners can be used with either piston or diaphragm actuators to provide excellent repeatability and accuracy. They offer rugged construction with few parts.

5 **WAFER-SPHERE® High-Performance Butterfly Valves**
Available in 3" to 48", these valves with wafer or single-flanged body, feature flexible lip seats and proprietary XTREME® sealing technology that provides tight shut-off in ethanol plant applications.

6 **4000 Series 3-Piece Ball Valve**
These standard port polymeric-seated 3-piece ball valves are available in Alloy 20 construction to withstand the pH swings in the fermentation process. The 3-piece design allows for in-line servicing. These valves offer long-lasting reliable shutoff and are fire-tested to meet the requirements of API 607.

Series 3A/3C Ball Valves
A staple in the fermentation process. Seat material options handle almost all commonly encountered fluids up to full body rating, including saturated steam up to 250 psi (17 bar.). Large port size provides high flow with minimum pressure drop. Extremely versatile valves, they are used in various places along the line in all of the ethanol production processes.

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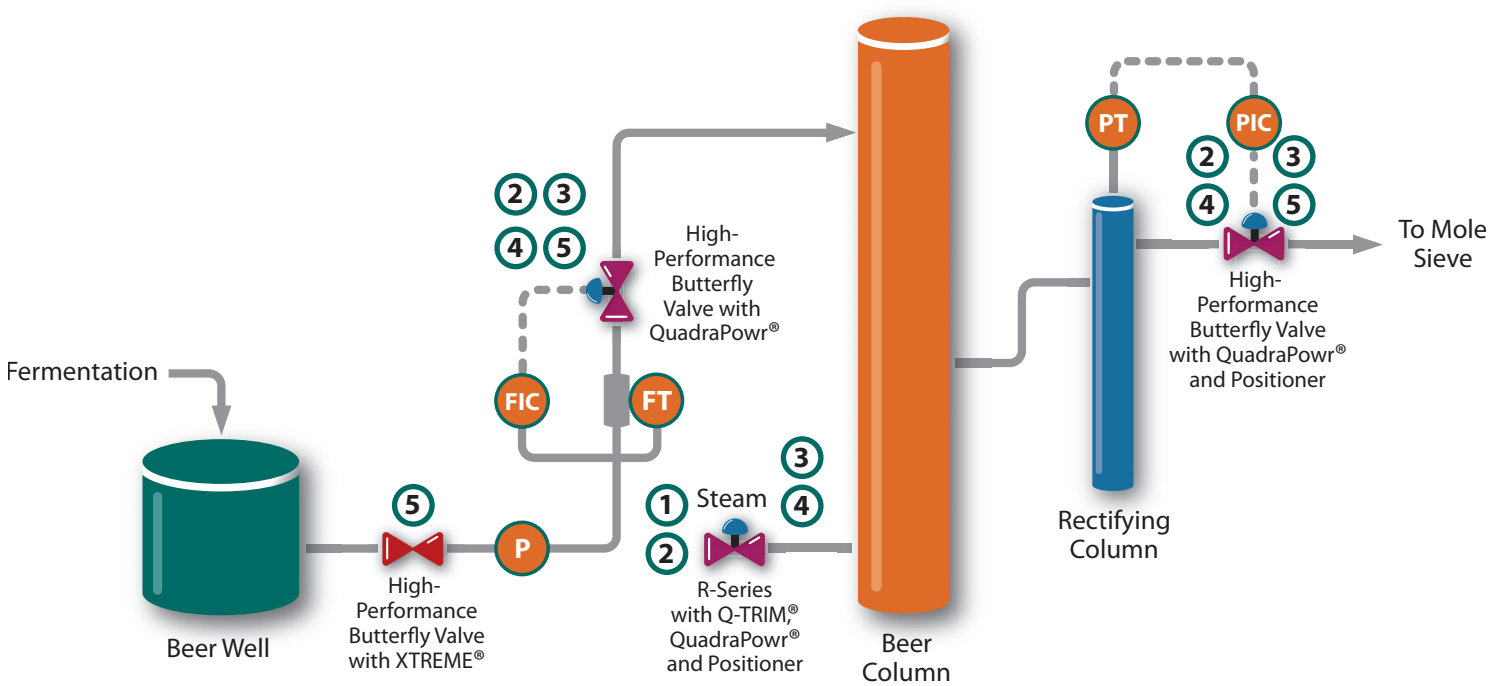
Process Safety Comes First.

One key area of concern at fuel processing plants is how to ensure the effective operation of ESD/ESV (emergency shutdown and venting valves) in order to prevent or minimize damage from fire or explosion. To help alleviate that concern, we offer automated safety valve monitoring and testing solutions that make certain that ESD/ESV values will be available if needed. Specialized valves are available with features like live-loaded stem seals to prevent transient emissions, and polymeric (Fire-Tite®) seats with metal carriers that provide effective shut-off even if the polymer has been destroyed by fire.

The Distillation Process:

Ensuring Tight Shut-off & Precise Control

It's true that as plants get bigger, so do the valves. But bigger valves mean more downtime for maintenance. So it's critical to specify valves that perform reliably over long periods. Distillation is a process in which steam service is critical. Low noise, tight shut-off and precise control are essential. Metso Automation products deliver the solution. It is also important to note that emergency water flush lines in these processes are susceptible to expensive leaks. Metso Automation excels in these applications as well.



1 **R-Series Control Valves with Q-TRIM®**
These valves offer the outstanding control performance and superior, long-lasting tightness so necessary in the distillation process. Q-TRIM® generally attenuates noise by up to 20 dBA and cuts vibration by more than 90 percent.

2 **QuadraPowr® Actuators**
The QuadraPowr® X spring-diaphragm actuator is a unique solution that provides exceptionally smooth and reliable actuation for 90° rotary valves. It combines the low air pressure requirements of a diaphragm actuator with the high pressure capacity of a piston actuator. The result is a smoother, more accurate operation.

3 **ND9000 Digital Valve Controller**
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4 **NE700 & NP700 Positioners**
Rugged construction. Few moving parts. Highly Responsive. NP700 pneumatic and NE700 electro pneumatic positioners can be used with either piston or diaphragm actuators to provide excellent repeatability and accuracy. Vibration resistance is achieved by a small moving mass and rigid mounting to a control valve.

5 **WAFER-SPHERE® High-Performance Butterfly Valves**
This valve combines a special off-center disc with proprietary seat designs and revolutionary XTREME® sealing technology for the tightest-sealing, longest-lasting, lowest-cost alternative to gate valves and other heavy, rotary-type valves. Positive shaft retention. Tight shut-off even in control applications. Inherent flow characteristic is modified equal percentage. New XTREME® seats provide longer life, expanded rangeability and greater value.

Manual 7150 Flanged Ball Valves
These standard port polymeric-seated flanged ball valves provide consistent flow capacity for isolation and control applications. They provide long-lasting reliable shut-off and are fire-tested to meet API 607 requirements. They are also used to isolate between the beer column and the stillage to centrifuge and evaporation process if needed.

Series 3A/3C Ball Valves
A 3-piece threaded or socket-weld body design can be used up to the full body rating of 1000 psi (69bar). Seat material options mean it can handle most common fluids up to full body rating. Extremely versatile valves, they are used in various places along the line in all ethanol production processes.

StoneL® QUARTZ® Switches
This advanced automation system combines Metso Automation's actuator experience with StoneL® advanced communication and control system technology to form a totally compact, integrated automation package. It dramatically simplifies, and reduces the cost of, automation rotary on/off valves by eliminating the need to engineer and procure a range of accessories that would otherwise have to be obtained separately.

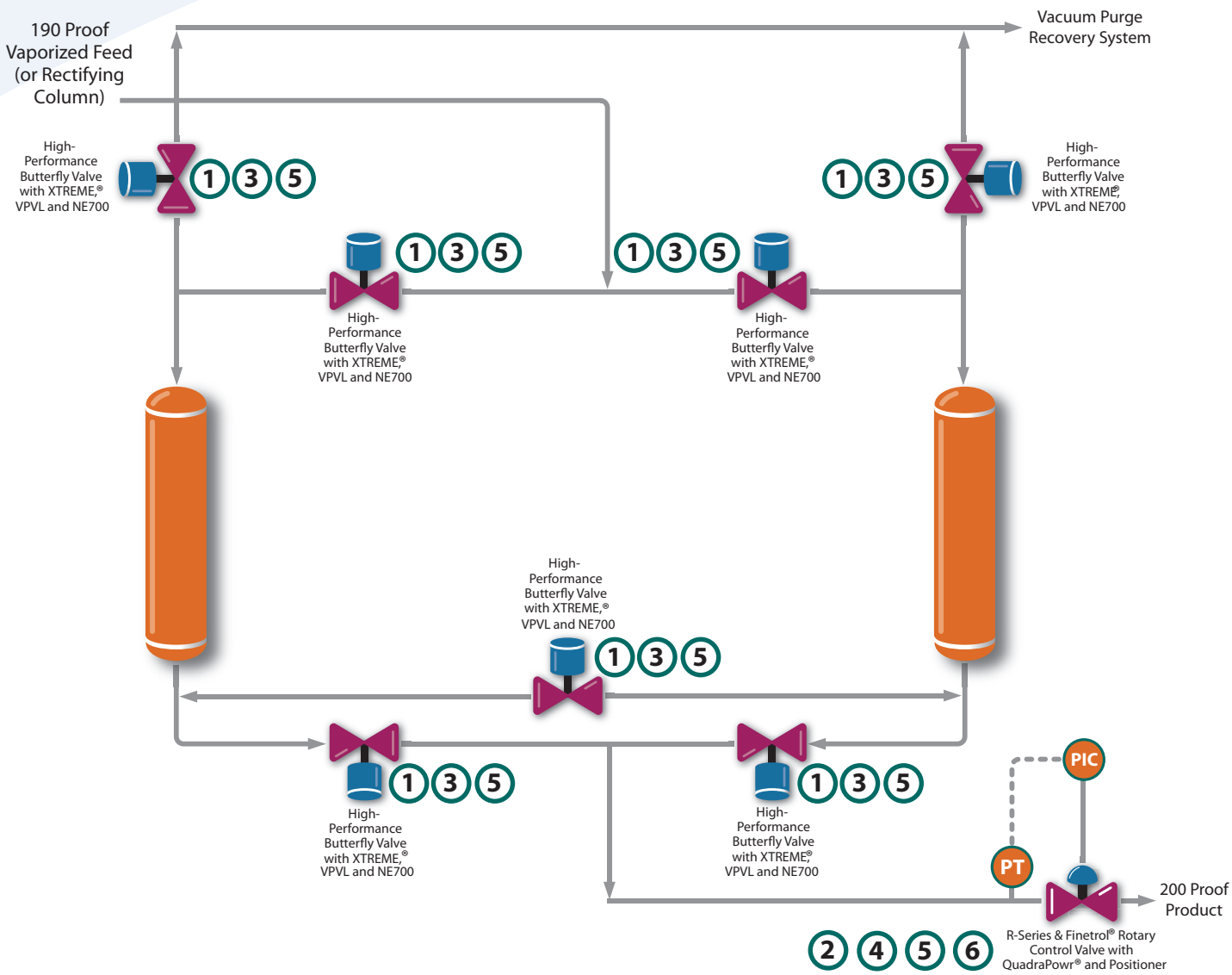
Quietly Getting It Done.

A sharp drop in pressure can create a high valve noise, frequently heard in an ethanol processing plant where an 80-90 psi drop can occur. Two major concerns: OSHA standards; and damage to equipment. The solution: Metso Automation R-Series control valve with Q-TRIM®. It reduces noise by up to 20dBA and can cut vibration levels by more than 90 percent. Designed to optimize performance in a compact design, these valves are ideal for minimizing noise in utility steam service – from slurry tanks to drum dryers – with no need for expensive diffusers.

The Molecular Sieve Drying Process:

Maintaining Precise Control With Zero Leakage

A critical stage in the ethanol process as the product is brought from 190 proof to a highly volatile 200 proof. Tight shut-off and stem emission control are crucial. So is safety. Leakage at this juncture is just not acceptable. Control valves in the molecular sieve application must provide precise modulation of fluids for optimal processing. On occasion the process requires a tight bi-directional shut-off to prevent process disturbances. Frequently, two valves are used: a modulating valve and a blocking valve for tight shut-off. Another option is to use a special soft-seated control valve designed specifically to provide tight shut-off.



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2 R-Series & Finetrol® Rotary Control Valves
These economical, high-performance control valves are designed to provide wider rangeability and control accuracy of liner valves with the inherent benefits of a rotary control valve. Standard units come with spring-diaphragm actuators and ND9000 intelligent valve controllers for precise flow control and extended operational life.

3 Series VPVL Actuators
Popular at many stages in the ethanol process, the VPVL double-opposed piston actuators feature many benefits including high cycle life, rugged construction, compact symmetrical design, and low cost.

4 ND9000 Digital Valve Controller
Designed to operate on virtually any valve actuator, it ensures the highest possible end product quality in all operation conditions with unique diagnostics and incomparable accuracy. In addition to the general purpose unit, the ND9000 is available in a flame proof enclosure for use in hazardous areas The flame proof version of the ND9000 is available with a variety of industry standardized certifications and approvals. These approvals meet a wide variety of hazardous area requirements, for complete application details and hazardous area classifications, refer to the ND9000 product bulletin.

5 NE700 & NP700 Positioners
The NP700 pneumatic and NE700 electro pneumatic positioner can be used with either piston or diaphragm actuators to provide excellent repeatability and accuracy. They offer rugged construction with few parts. A small moving mass and rigid mounting to either a rotary or linear control valve provide excellent vibration resistance. Multiple pilot valve sizes are used to match positioner capacity to actuator stroke volume for improved responsiveness.

6 QuadraPowr® Actuators
The QuadraPowr® X spring-diaphragm actuator is a unique solution that provides exceptionally smooth and reliable actuation for 90° rotary valves. It combines the low air pressure requirements of a diaphragm actuator with the high pressure capacity of a piston actuator. The result is a smoother, more accurate operation.

Series 3A/3C Ball Valves
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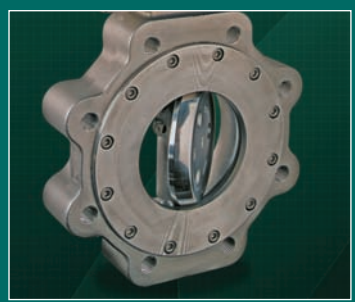
Long-term Reliability On The Molecular Level.



Our WAFER-SPHERE® high-performance butterfly valves can be equipped with XTREME® seat material, filled super-TEFLON shaft seats, PEEK thrust bearings, 316SS/woven PTFE shaft bearings, excluder rings, and a B-Series actuator to create the optimal high cycle automation package. As a result, they provide over 3 million cycles while maintaining tight shut-off – the ideal solution for molecular sieve applications.

Maximizing Volume, Safety & Efficiency:

From Ethanol Storage To Transportation

Ethanol Storage

Prior to construction of the storage area, it might be smart to specify long-lasting and dependable Metso Automation block valves. In this case, it's easier to install them now rather than when the tanks and lines are full of flammable hydrocarbons.

Valve Solutions for Ethanol Storage

FM/CSA Automatic Shut-off Assemblies

These valve assemblies are qualified to FM/CSA standards with options that allow for customization to your specific application. Collectively, they provide protection against fire and explosive hazards during light-off and operation of fuel or gas burning equipment. When the electrical signal is interrupted or when there is a loss of air pressure, the fuel line to the 1052 will close rapidly to give positive shut-off of fuel flow. In the 1056 and 1057, the gas-line valves operate rapidly to isolate or allow gas flow. This action may be initiated either by safety trip or normal shutdown sequencing.

Ethanol Transportation

When it comes to transportation, four out of five tank cars carrying ethanol are equipped with our valves. High-performance ball and butterfly valves are the tightest sealing, longest lasting, and most cost-effective valves for handling the demands of tank loading and unloading. They combine high volume flow capacity with proprietary seat and sealing technologies to make the loading and unloading of ethanol more efficient.

Valve Solutions For Ethanol Transportation

RET Bottom Unloading Ball Valves

The RET flanged ball valve has a relatively narrow 6.75 in. (159mm) profile and is available in a wide variety of materials to satisfy most tank car applications. FIRE-TITE® fire-tested Xtreme® seat construction ensures fast, high-capacity flow of almost all materials, including abrasive slurries and viscous fluids – making them especially suitable for ethanol unloading.

Plantwide Solutions

Series 3A/3C Ball Valves

A 3-piece threaded or socket-weld body design can be used up to the full body rating of 1000 psi (69 bar). Seat material options mean it can handle most common fluids up to full body rating. Extremely versatile valves, they are used in various places along the line in all ethanol production processes.

Series 835 Process-Rated Class 150

WAFER-SPHERE® Butterfly Valves

These valves are an ideal cost-effective solution for large diameter, high-capacity infrastructure requirements. Available in 30" to 60" sizes, the Series 835 is rated to 100 PSI. The single-flanged body utilizes flexible lip seat design and proprietary XTREME® sealing technology to provide tight shut-off in ethanol plant applications.

StoneL® QUARTZ® Switches

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CINTAC Advanced Automation System

Gives customers scalable on-off valve networking in an affordable, compact, fully-assembled package that works with any quarter-turn valve in any application.

The system combines highly advanced valve monitoring and networking technology with a pneumatic module and state-of-the-art actuator. It's highly accurate, quick to install, extremely durable, and easy to maintain.

Ready For Any Emergency.

The FM-approved 1075 Emergency Shut-off and Firesafe Valves are manual assemblies consisting of FIRE-TITE® valves and TORQ-HANDLE®. They provide automatic closure of a normally open valve in the event of a fire or excessive temperature. These versatile assemblies from Metso Automation are used for all types of media including flammable gases, liquids, and toxic fluids. Included in the line of 1075 Emergency Shut-off Valve assemblies are ½"-1" (DN 15-25) Series 7150 flanged ball valves and 1"-2" (DN 25-50) Series 2000 Clincher® screwed-end ball valves equipped with TORQ-HANDLE® spring-return handles and a choice of fusible links for specific temperature requirements.

R-Series Segment Ball Valves

Size	Pressure Classes	Maximum Temperature	Body/Trim Materials[1]	Bulletin
1" - 20" (25 – 500DN)	PN 10-40 ASME 150 -300	480˚ F (250˚ C)	CF8M, WCB CG8M Titanium Hastelloy® C	3R20

Series 3A/3C Ball Valves

Size	Maximum Pressure	Maximum Temperature	Body/Trim Materials[1]	Bulletin
1/2" - 2" (15 – 50DN)	1000 psi (69 bar)	500˚ F (260˚ C)	Carbon Steel 316SS	B105-4

Series 3000 Ball Valves

Size	Maximum Pressure	Maximum Temperature	Body/Trim Materials[1]	Bulletin
1/4" - 2" (8 – 50DN)	2000 psi (138 bar)	500˚ F (260˚ C)	Carbon Steel 316SS	B104-1

Series 9000 and 6000 Flanged Ball Valves

Series	Sizes	Port	Pressure Classes	Maximum Temperature	Body/Trim Materials[1]	Bulletin
9000	1/2" - 2" (15 – 300DN)	Full	150 (19 bar) 300 (51 bar)	550˚F (288˚C)	316SS Alloy 20 Monel Hastelloy® C	B107-2
6000	14" – 24"(350 – 600DN)	Full	150 (19 bar) 300 (51 bar)	450˚F (232˚C)		

Finetrol® Rotary Control Valves

Size	Maximum Pressure	Maximum Temperature	Body/Trim Materials[1]	Bulletin
1" - 10" (25 – 150DN)	PN 10 - 100 ASME 150 - 600	750˚ F (400˚ C)	CF8M WCC	5FT20

Series 7000

Size	Port	Pressure Classes	Maximum Temperature	Body/Trim Materials[1]	Bulletin
1/2" - 10" (15 – 250DN)	Std.	150 (10.3 bar) 300 (21.0 bar)	550˚ F (288˚ C)	Carbon Steel 316SS Alloy 20 Monel® Hastelloy®C	B107-1

4000 Series 3-Piece Ball Valve Alloy 20

Size	Port	Maximum Pressure	Maximum Temperature	Body/Trim Materials[1]	Bulletin
1/2" - 2 1/2" (15 – 65DN)	Std.	2500 psi (172 bar)	600˚ F (316˚ C)	Carbon Steel 316SS	B105-1
1/2" - 2" (15 – 50DN)	Full				
1/2" - 2 1/2" (15 – 65DN)	Std.	600 ANSI (102 bar)	550˚ F (288˚ C)		
1/2" - 2" (15 – 50DN)	Full				

[1] Consult factory for specific material availability.
Monel® is a registered trademark of Inco.
Hastelloy® is a registered trademark of Haynes International, Inc.

WAFER-SPHERE®

Series ANSI	Body Style	Size Range	Maximum Pressure/Temp.	Minimum Pressure/Temp.	Body/Trim Materials	Seat Materials	Bulletin
815 Class 150	Wafer	2 1/2" - 30" (DN 65-750)	285 psi @ 100°F (19.6 bar @ 37.7°C)	500°F @ 285 psi (260°C @ 19.6 bar)	Carbon Steel 316 SS Ductile Iron Alloy 20	Teflon XTREME®	W101-6
	Lugged	2 1/2" - 60" (DN 65-1500)					
835 Class 150	Lugged	30" - 60" (DN 750-1500)	100 psi @ 500°F (6.9 bar @ 260°C)	500°F @ 100 psi (198.9°C @ 6.9 bar)			W105-1
830 Class 300	Wafer	3" - 30" (DN 80-750)	740 psi @ 100°F (51 bar @ 37.7°C)	500°F @ 375 psi (260°C @ 25.8 bar)	Carbon Steel 316 SS		W101-6
	Lugged	3" - 36" (DN 80-900)					

Series VPVL Actuators

Series	Type	Action	Pressure Input (psi)	Torque Output (ft/lb)	Bulletin
VALV-POWR® VPVL Model C	Pneumatic Piston	Double-acting	40 - 100 (2.7 – 6.9 bar)	2.5 - 4581 (3.2 - 6211 N-m)	A111-3
		Spring-return	60 - 80 (4.2 – 5.5 bar)	3.7 - 1463 (4.9 - 1983 N-m)	

B-Series Actuators

Series	Type	Action	Pressure Input (psi)	Torque Input (ft/lb)	Bulletin
B1C B1J	Pneumatic Rotary Cylinder	Double-acting Spring-return	40 - 140 (2.8 - 10 bar)	30 - 73800 (40 -100000 N-m)	6B20, 6B21

QuadraPowr®X Actuators

Series	Type	Action	Pressure Input (psi)	Torque Output (ft/lb)	Bulletin
QUADRA-POWR X	Diaphragm	Spring-return	20 - 100 (1.4 bar – 6.9 bar)	11 - 587 (15 – 796 N-m)	A110-4

ND 9000 Valve Controller

Series	Type	Input	Split Range	Supply Power	Vibration Effect	Bulletin
9000	Smart Digital Positioner	4 -20 mA	4 - 2 mA 12 - 20 mA	Taken from the 4...20A control signal	<1%	7ND21 7ND/B20

NP700 & NE700 Positioners

Series	Type	Input	Split Range	Ambient Temperature	Vibration Effect	Bulletin
NP700	Pneumatic	4 -20 mA	4 - 12 mA 12- 20 mA	200˚F (90˚C)	<1%	7NENP20
NE700	Electropneumatic	0 - 20 mA	0.2 - 1 bar 0.6 - 1 bar	185˚F (85˚C)		

CINTAC Advanced Automation System

Type	Action	Pressure Input (psi)	Torque Output (ft/lb)	Enclosure	Voltage	Bulletin
Pneumatic Piston with High Accuracy, Contactless, Solid State Sensors and Universal Power Input Pilot Valve	Double Acting	40-100 (2.7 - 6.9 bar)	12 - 1860 ft lbs (16 - 2524 N-m)	NEMA 4,4x, 6 class I & II DIV2 Class I & II DIV 1 & 2 Intrinsically Safe	AC or DC	A130 -1
	Spring-Return	60-80 (4.2 - 5.5 bar)	6.7 - 540 ft lbs (8.5 - 732 N-m)			

Valve Service

Metso Automation offers you total service both before and after you take delivery of the right valve. We provide a complete network of knowledgeable distributors located throughout the United States and Canada; a highly trained group of sales representatives, field technicians and specialists, and a full staff of application engineers waiting to serve you. Our nationwide service and repair centers are always on call to service and maintain our products to OEM standards. You'll get total confidence in your Metso Automation valve solution with new valve warranties, OEM parts and know-how, conformance to OEM dimensions, and complete documentation.

For information on repair service visit www.MetsoAutomation.com

Metso Automation

Europe
Levytie 6, P.O. Box 310
00811 Helsinki, Finland
Tel. int. +358 20 483 150
Fax int. +358 20 483 151

North America
44 Bowditch Drive, P.O. Box 8044
Shrewsbury, Massachusetts
01545-8044 U.S.A.
Tel. int. +1 508 852 0200
Fax int. +1 508 852 8172

Europe
6-8 rue du Maine
68221 Wittenheim Cedex, France
Tel. int. +33 (0)3 89 50 64 00
Fax int. +33 (0)3 89 50 64 40

Latin America
Av. Independência
2500-Iporanga, 18087-101
Sorocaba-São Paulo
Brazil
Tel. int. +55 15 3235 9700
Fax int. +55 15 3235 9748/49

Middle East
Jebel Ali Freezone, P.O. Box 17175
Dubai
United Arab Emirates
Tel. int. +971 4 883 6974
Fax int. +971 4 883 6836

Asia Pacific
238A Thomson Road
#25-09 Novena Square Tower A
307684 Singapore
Tel. int. +65 6511 1011
Fax int. +65 6250 0830

www.MetsoAutomation.com
www.MetsoEthanol.com

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