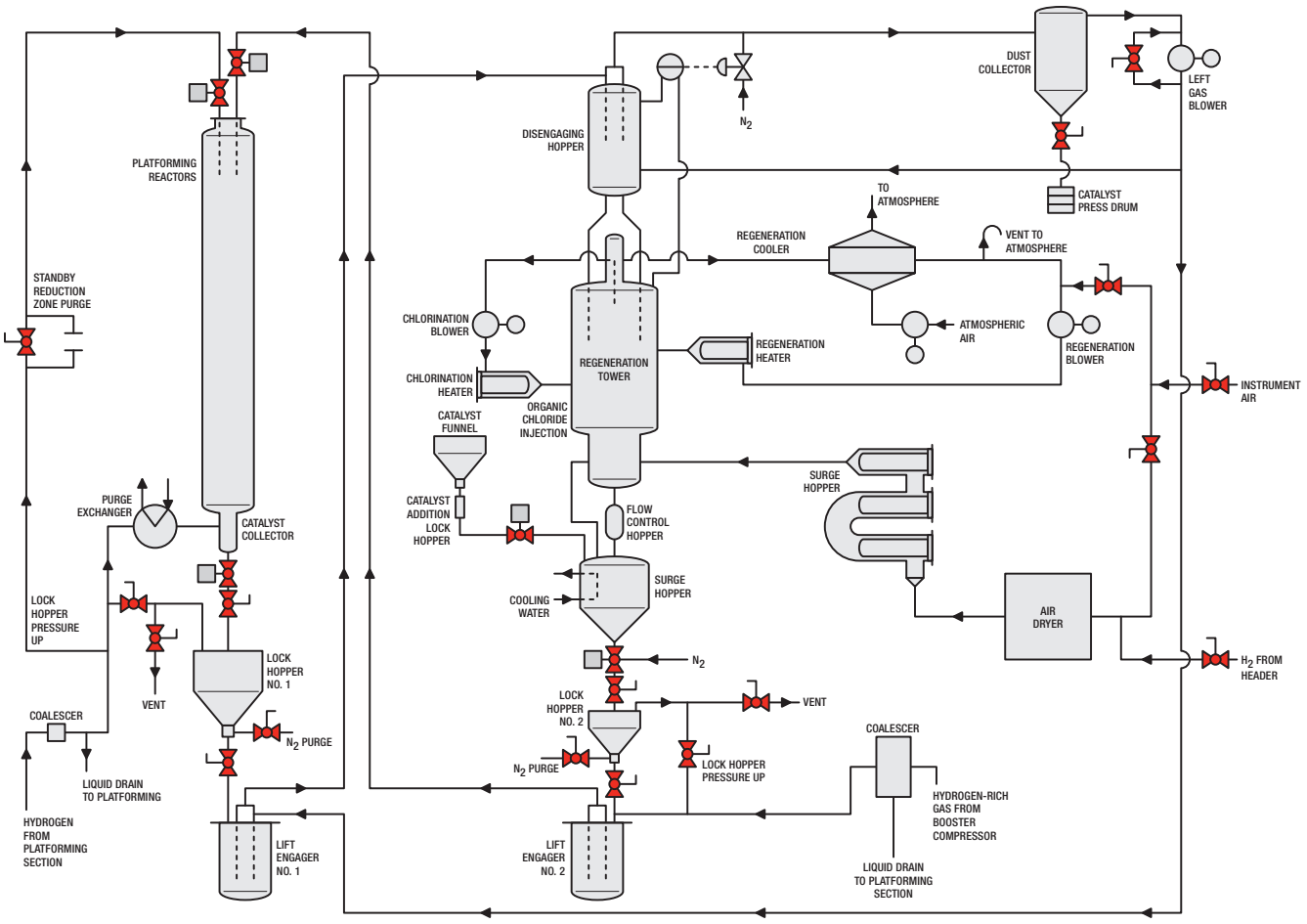
Continued Catalyst Regeneration

Benefits of MOGAS Valves

MOGAS Valves Solve Critical Conditions in the CCR Process

Control of pressure within the platforming process affects the reformer yields, reactor temperature requirements and catalyst stability. Critical to the stabilization of the entire process are the lockhopper isolation, catalyst addition, reactor isolation and vent valves. MOGAS has an excellent performance resumé — with over 25 years of experience in CCR specific installations, our valves have continuously improved the refinery's overall runtime and plant efficiencies.

Continued Catalyst Regeneration Section



MOGAS ball valve installations

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MOGAS® SEVERE SERVICE BALL VALVES

Continued Catalyst Regeneration

Benefits of MOGAS Valves

MOGAS Valves Solve Critical Conditions in the CCR Process

Safely Handling Hydrogen to Eliminate Hazardous Fires
The potential for hydrogen fires caused by external body or stem leaks is a significant concern. MOGAS metal-seated, severe service ball valves do not expose critical sealing components exposed to the damaging effects of catalysts. The continuous scratching of catalyst fines to any exposed seats or plugs could eventually allow dangerous leak-through-to-atmosphere resulting in H2 fires. With everyday operation, the self-wiping ball and seat configuration cleans away any built-up debris.

Eliminating Catalyst & Dust Build-up
As the catalyst breaks down, harmful dust is produced. If catalyst dust migrates into the packing chamber of the valve, it can erode the stem packing, causing an external leak. A rising, rotational stem action can create areas for this build-up. With a quarter-turn, non-rising stem found in MOGAS ball valves, this problem is eliminated.

Dependable Cycling Prevents Interruptions
A CCR unit is a timed process. Valves are expected to open and close at certain times to allow or stop the flow of catalyst. If a valve fails to operate, the process cannot perform and locks up. Additionally, if a valve is leaking enough to affect the pressure on the next lockhopper, the unit controls will not allow the process to move on to the next step. Quick, quarter-turn operation provided by MOGAS severe service ball valves is the best solution for this situation.

Maintaining Design Integrity During Thermal Expansion
If the operating temperatures are elevated, or an upset in the process occurs, thermal expansion of valve components can cause concern. The material and coating selections, combined with the engineered geometry allowances of the MOGAS ball valve, ensure reliable and adequate protection against extreme heat variations.

Partial Installation List of UOP CCR Valves

Customer	Location
Petro Canada w/Bettis actuators	Canada
NODCO w/manual gears	Qatar
Talimandu w/manual gears	India
ExxonMobil w/manual gears	United Kingdom
Yukong w/manual gears	Korea
JGC w/manual gears	Japan
Zhenhai Refinery w/manual and Bettis	China
PKN Orlen w/Bettis actuator	Poland
Valero w/manual gears	Corpus Christi, Texas USA
ExxonMobil w/manual gears	Singapore
Mangalore Refinery w/pneumatic actuator	Malaysia
Madero Refinery manual valves	Mexico

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MOGAS® SEVERE SERVICE BALL VALVES

Continued Catalyst Regeneration

Features of MOGAS Valves

MOGAS Ball Valve Design Features

Ball and Seat Assembly

Critical to the success of a valve in the CCR process is the valve's capabilities to handle catalyst & catalyst dust, and the high cycles required by the application. MOGAS tackles these problems by oversizing the sealing seats and lapping them to achieve 100% contact between the sealing areas of the ball and seats.

MOGAS uses a diamond lapping compound to mate the seats to the ball. Verification is performed using a "bluing" on the ball surface, guaranteeing a .0001" or better fit. With 100% contact between the ball and seats, scrapers are created at the edges of the upstream and downstream seats. This ensures that a continuous wiping action occurs every time the valve is cycled. This cleans the surface of the ball, thus ensuring zero leakage and consistent torque over the life of the valve.

With a very wide sealing area of 100% contact, there is lower stress exerted on the seat. This is important considering the size of the valves and the cycles they will perform per year. By lowering the stress on the wide sealing area, it extends the life of the sealing components.

Coating Selection

For CCR platforming applications, MOGAS uses HVOF chromium carbide, which is approximately 65 Rc. With this coating the ball and seat assembly have compatible growth rates, preventing bond failure at temperature due to excessive shearing stresses between the base material and coating. The coating has strain to fracture of .6%, contributing to the overall number of cycles the valve can handle.

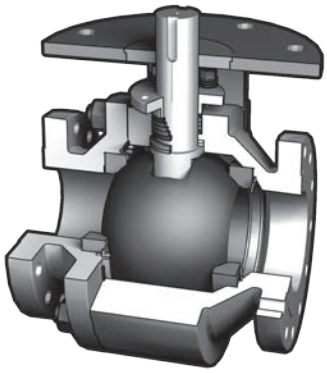
Locked-in Downstream Seat

MOGAS laps the downstream seat into the end connection to achieve a metal-to-metal seal. After "bluing" verifies the seal, retaining rings are used to lock the seat in place, thus eliminating the opportunity for catalyst dust to develop behind the seat. When doing routine maintenance, this is easily replaceable.

Foul-Resistant Upstream Seat

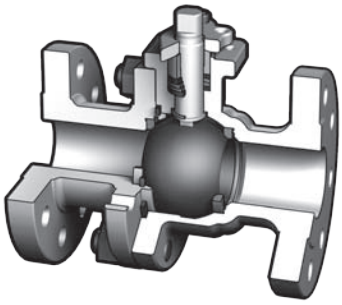
MOGAS uses a proprietary upstream seat that minimizes the effect of coke build-up in this critical area. MOGAS believes in either totally eliminating the gaps around the seats (like in the downstream seat) or opening the area around the seat as much as possible.

In bi-directional applications, a second thermal spring is added. Both springs seal against the body and the seat preventing catalyst dust build-up between the springs.



C-Series

- Available in 1 to 4 inch
- ASME Class 300
- Bi-directional
- Sealing / solids resistant
- High cycle



Isolator

- Available in 1 to 4 inch
- ASME Class 300
- Bi-directional
- Sealing / solids resistant
- Medium to low cycle

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MOGAS® SEVERE SERVICE BALL VALVES

Continued Catalyst Regeneration

Features of MOGAS Valves

MOGAS Ball Valve Design Features (continued)

Repairability
MOGAS valves are designed to be easily repaired and re-installed in the field. Special features, such as the precision machined mounting bracket and stem bushing, simplify actuator installation. Two-piece inner stem seals allow easy replacement, rather than requiring shop welding and machining of worn areas. Balls, seats and springs are easily replaced in the field — no measurements or pre-loading of the components are required.

Two Piece Inner Stem Seal
The MOGAS design material and coating for the two hard-coated and lapped metal thrust bearings is 410SS/Nitrided or an optional 410/HVOF chrome carbide. These serve as a pressure energized inner stem seal, as well as a bearing. This prevents migration of catalyst dust — or catastrophic packing blowout — by keeping the stem aligned and solids from entering the packing chamber, thus providing for extended cycle life.

Stem Area
In CCR applications, the high strength, blow-out stem is made of A638 Gr. 660 (optional material is 410SS), which is a precipitation hardened, iron based, super alloy bar for high temperature service.

Stem Support Bushing
The MOGAS design incorporates a stem bushing above the packing gland and stem. This component, working in unison with the inner bearing, supports and eliminates radial stem movement and packing deformation caused by side loading of the stem by the actuator. The result is lengthened stem seal life to eliminate packing leaks.

Live-Loading of Stem Seal
MOGAS live loads all their stem packing gland followers to ensure constant packing energization is provided after both thermal and mechanical cycling.

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