

INNO-CON® - INNO-MAT®

Metal Seated Liftplug Valves & Automation

a proven valve design with state of the art actuation options

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REFCOMM®
ROTTERDAM
30 September–3 October 2019



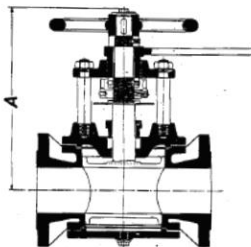
INTRODUCTION

- History of lift plug valves
- Advantages of the lift plug valve design
- Challenges and solutions of the lift plug valve design
- New developments and design updates

HISTORY



Polte-Drehschieber D. R. P.



Der Polte-Drehschieber findet in allen Fällen Verwendung, in denen es sich um dicke oder heiße, in kaltem Zustande erstarrende Flüssigkeiten handelt.

Hierbei ist von größter Bedeutung, daß ein Eindringen dieser Flüssigkeiten in das Gehäuse-Innere vermieden wird. Diese Aufgabe ist mit unserer Konstruktion gelöst. Der mit der Durchgangsöffnung versehene, drehbare, schwachkegelige

Verschlusskörper wird in der Verschluss- und Öffnungsstellung in seinen Sitz so hineingepreßt, daß eine unbedingt zuverlässige Abdichtung erreicht ist.

Das Öffnen und Schließen erfolgt wie bei den gewöhnlichen Schiebern durch Drehen des Handrades. Eine Zeiger-Vorrichtung mit Skalenscheibe oder Markenstrich auf dem Handrad zeigt die jeweilige Einstellung an.

Um die Öffnungs- oder Schließbewegung auszuführen, muß der Verschlusskörper vorher durch Linksdrehen des unter dem Handrade liegenden Handgriffes etwas angelüftet werden. Das Anlüften darf indessen nur gering sein, die Bewegung kann deshalb durch Anschlag entsprechend der Viskosität der Flüssigkeiten begrenzt werden. Durch Drehen dieses Handgriffes nach rechts wird dann der Verschlusskörper wieder in seine alte Lage gebracht.



Polte-Drehschieber für erstarrende Flüssigkeiten, D. R. P. nach Figur 305 und 306.



Figur 305
mit geradem Durchgang.



Figur 306
mit Dreiweg-Durchgang.

Ansführung: Der Schieber wird mit geradem, Winkel-, u. Mehrwege-Durchgang geliefert. Die Anfertigung erfolgt ganz aus Craditen, Stahlgieß, Rotgüß oder säurebeständigem bzw. dem Verwendungszweck entsprechenden Material. Die Gehäuse können auch seitlich mit Putzöffnung versehen werden, die eine Reinigung des Schieberes während des Betriebes zuläßt. Der Einbau kann in jeder Lage, selbst mit nach unten gerichteter Spindel, erfolgen. Flanschen nach DIN (siehe Normaltabelle III ND 10) oder nach den Gefrober-Normalen von 1882 (siehe Normaltabelle I) benannt und geliefert.

Die Schieber erhalten einen schwarzen Lackanstrich.

Lichte Weite mm	Flansch-Durchmesser nach DIN ND 10 mm	Boßlänge nach Norm. 1882 mm	Boßlänge Figur 305 mm	Schenkel- länge Figur 306 mm	Boßhöhe ca. mm	Handrad Ø mm	Gewicht einschl. Handrad Figur 305 ca. kg	Gewicht einschl. Handrad Figur 306 ca. kg
40	150	180	230	115	280	210	25	28
50	165	160	250	125	265	210	28	32
(60)	175	175	270	135	290	210	35	39
70	185	185	290	145	300	265	41	45
80	200	200	310	155	325	265	48	54
(90)	210	215	330	165	370	265	60	65
100	220	220	350	175	390	300	78	85
125	250	260	400	200	410	300	97	105
150	285	290	450	225	460	360	155	160
(175)	315	320	500	250	480	360	205	210
200	360	350	550	275	600	400	285	292
(225)	370	370	600	300	635	400	Auf Anfrage.	
250	395	400	650	325	680	500		
(275)	420	425	700	350	720	500		
300	445	450	750	375	800	600		

Bei Anfragen und Bestellungen bitte allgemeine Angaben Seite 3-5 beachten.

Lift Plug Valve Design utilized in the industry for over 100 years with several patent applications since 1914

Valve catalog of POLTE Valves in Magdeburg, Germany from 1931

HISTORY



Lift Plug Valves found application in

- coal fired steam systems,
- catalyst cracking units,
- rubber processing,
- delayed coker and
- other severe service hydrocarbons and chemical applications



Common Applied Valve Types

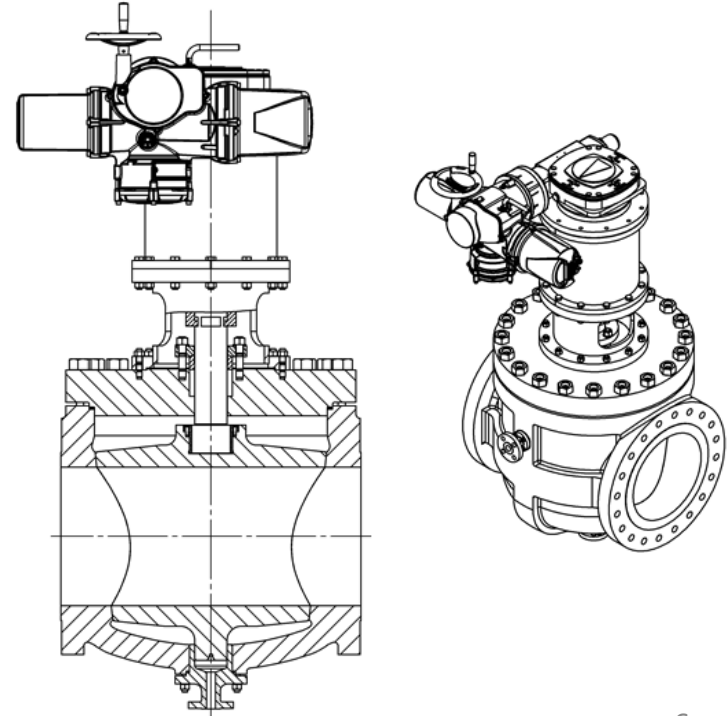
- Lift Plug Valves such as MIAM INNO-CON
- Metal Seated Ball Valves
- Gate Valves

*INNO-SWITCH – MIAM
Delayed Coker Switch
Valve*



ADVANTAGES of INNO-CON Lift Plug Valves

- Simple **robust design** with only 3 major parts (body, cover, plug)
- **Protected seats** when plug is in open or close position
- **No friction** operation as plug is lifted off seats specifically designed for high cycle service such as in delayed coking units
- Top entry design – in line maintenance/de-coking
- Shut off force from outside the valve, can be increased by increasing torque (tapered plug)



ADVANTAGES of INNO-CON Lift Plug Valves

- Lifting Design in conjunction with steam purging enables active cleaning of the seats at every operation
- Steam only consumed when plug is lifted off the seats (during opening/closing operation)

Steam Purge Connections

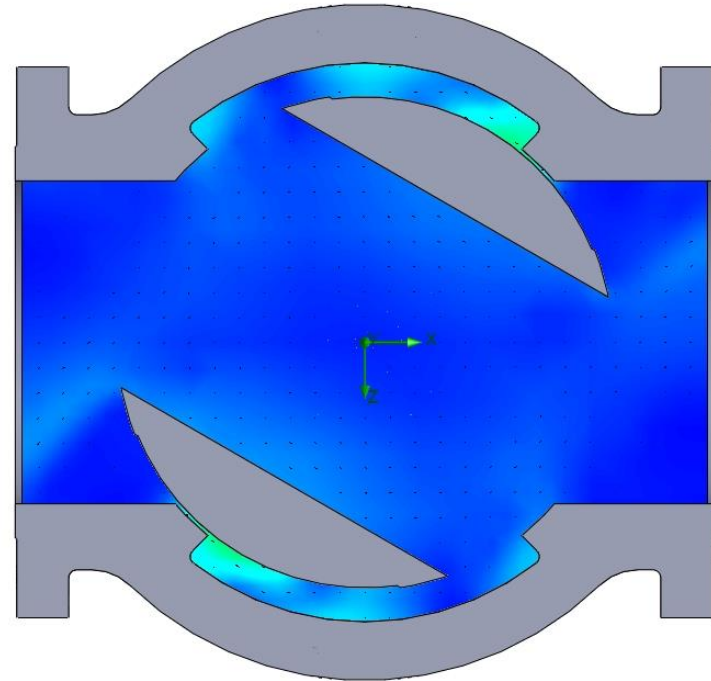
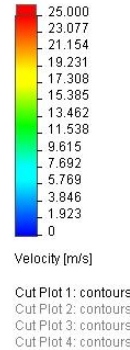


ADVANTAGES of INNO-CON Lift Plug Valves

CFD simulation of purging

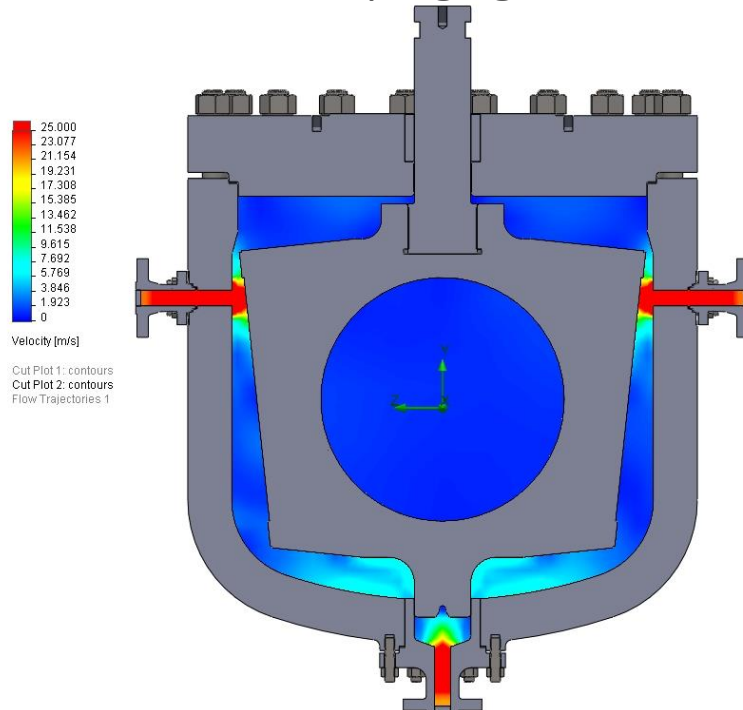
- Valve size: NPS 16 / #300
- Plug lifted of the seat and partially turned
- 3 purge connections
- Steam with 3 bar differential pressure

With plug turned some area around plug exposed to process – cleaning imperative in severe services

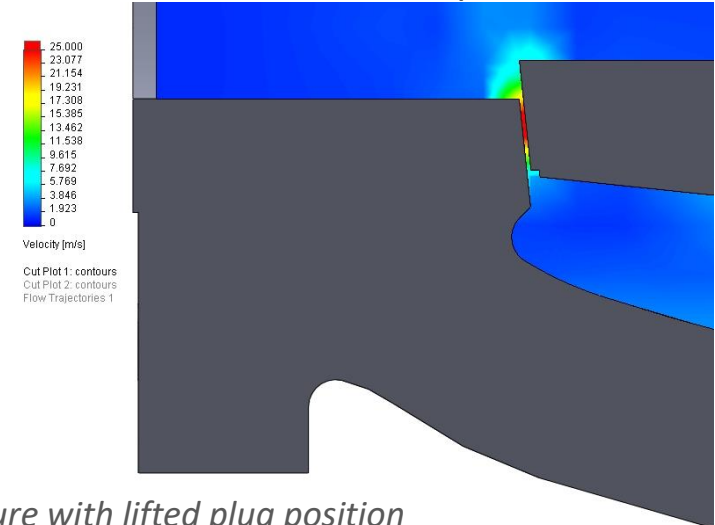


ADVANTAGES of INNO-CON Lift Plug Valves

CFD simulation of purging



- Valve size: NPS 16 / #300
- Lifted plug position
- 3 purge connections
- Steam with 3 bar differential pressure



Detailed picture with lifted plug position

ADVANTAGES of INNO-CON Lift Plug Valves

Low Cost of Ownership

- Large Seating Area - Continuous seat integrity and sealing performance
- Steam only consumed when valve is operated
- Leakage Rate A as per ISO5208 (0 bubbles/drops)
- Torque Seated tapered plug, increased torque = higher shut off force



ADVANTAGES of INNO-CON Lift Plug Valves

Low Cost of Ownership

- Simple Robust Design with no special spare parts required
- Lifting Design – No metal on metal friction on seats when operated
- In-Line de-coking (disassembly in line)
- Limited required inventory for spare parts and spare valves



HISTORICAL CHALLENGES

Actuation

- Valve requires 2 movements:
 1. Lifting of Plug
 2. Turning of Plug
- Automation was a challenging task with screw gear heritage technology
- Mechanism to lift and turn the plug with one actuator



HISTORICAL CHALLENGES

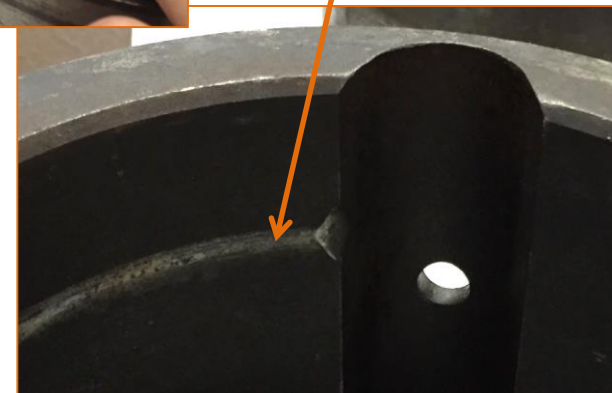
Heritage Options: SCREW GEAR

- Movement based on threading and indexing balls
- Indexing balls must move in and out of a race to enable unit to make transition from up and down movement to 90° turn movement
- Forces from valve along with required tolerances in the mechanism often lead to lock up of the system and damages in the mechanism
- Does not allow for back and forth cycling



*Indexing ball track
with much wear and
tear from the force
transmission via the
ball*

*wear of ball track on
the housing*



NEW DEVELOPMENTS

- Patented proven and reliable heavy duty lift and turn mechanism
- Optimum force transmission
- Smooth and fast operation
- Simple to automate
- Higher lifting than thrusting force to eliminate sticking plugs
- Standard range from 3-200tons of thrust output (other options on request)

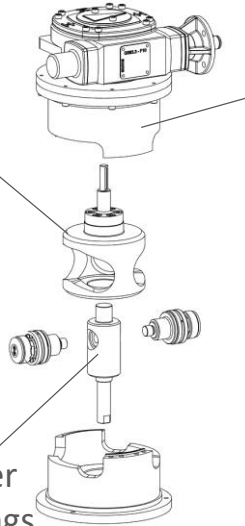
*INNO-MAT with Actuator on 12"
CI 600 INNO-CON Lift Plug Valve*

NEW DEVELOPMENTS

Actuation: INNO-MAT®

Turnable Gear
Cylinder with
slope

- Guided in the
body



Turnable Stem Cylinder
with Axles with bearings

- Guided in gear cylinder

„Static“ Body with
limiter cut out

Slope in Gear Cylinder
connected to limiter cut out
in body through the axles



Stem cylinder forced to move
as desired (up, 90° turn,
down)



NEW DEVELOPMENTS

Actuation: INNO-MAT®



*Cycle Tested to 3600 cycles
Fire Safe and then cycle tested*



*Retrofits on off-
brand valves*



*INNO-MAT on MIAM
INNO-CON Valves*



REFERENCES

Actuation: INNO-MAT® at Suncor, Edmonton Refinery, Canada

- Delayed Coker (Feed Line and Overhead Vapor Line)
- Valves in service are Lift Plug Type Valves with heritage Screw Gear Technology provided by the OEM of the installed valves

Operational Challenges:

- The majority of the issues with the OEM plug valve have been with the heritage design Screw Gear technology
- Lower reliability of actuation due to occurrences of lock up of screw gears
- High frequency of maintenance activities due to repair/change out of screw gears

REFERENCES

Actuation: INNO-MAT® at Suncor, Edmonton Refinery, Canada

Installation of New INNO-MAT IM-30 on existing 10" feed line lift plug valves and IM-50 on existing 24" overhead vapor line valves in 2017 & 2018

Experience since Installation:

- Retrofitted valves with INNO-MAT have proven to be working as planned
- Higher reliability in operating these valves at much reduced maintenance requirements

It is planned to retrofit more INNO-MAT on further existing valves towards Q4/2019

REFERENCES

Valve & Actuation: INNO-CON® with INNO-MAT® at OMV Petrom, Petrobrazi Refinery, Romania

- Delayed Coker (Overhead Vapor Line)
- Replaced Valves in service were metal seated ball valves

REFERENCES

Valve & Actuation: INNO-CON® with INNO-MAT® at OMV Petrom, Petrobrazi Refinery, Romania

- Installation of new INNO-CON with INNO-MAT and electric actuator in overhead vapor line valve in 2018

Experience since Installation:

- Very good reliability in operating these new valves with the INNO-MAT system
- No unscheduled maintenance activities thus far



16" CI 300 INNO-CON with INNO-MAT

REFERENCES

Valve & Actuation: INNO-SWITCH® at OMV Petrom, Petrobrazi Refinery, Romania



- Delayed Coker (Switch Valve)
- Replaced Valves in service was Lift Plug Type Valve

REFERENCES

Valve & Actuation: INNO-SWITCH® at OMV Petrom, Petrobrazi Refinery, Romania

- Installation of new INNO-SWITCH and fully automated electric actuation system in 2018

Experience since Installation:

- Very good reliability in operating the new Switch Valve with the supplied automation system



10" CI 600 INNO-SWITCH

REFERENCES

Valve & Actuation: INNO-CON® with INNO-MAT® at Rosneft,
Novokuibyshevsk Refinery, Russia

- Delayed Coker (Feed Line and Overhead Vapor Line)
- Replaced Valves in service were Lift Plug Type Valves with heritage Screw Gear Technology



Operational Challenges:

- Valves were often not being able to be operated as the system would lock up in the screw gear
- Unscheduled downtime and loss in production due to low reliability of actuation due to occurrences of lock up of screw gears
- Unplanned cost for maintenance or replacement of parts

REFERENCES

Valve & Actuation: INNO-CON® with INNO-MAT® at Rosneft, Novokuibyshevsk Refinery, Russia

- Installation of new INNO-CON with INNO-MAT and electric actuator feed line and overhead vapor line valves in 2016 and 2017

Experience since Installation:

- Very good reliability in operating these new valves with the INNO-MAT system
- No unscheduled maintenance activities thus far



ROSNEFT



12" CI 600 INNO-CON with INNO-MAT

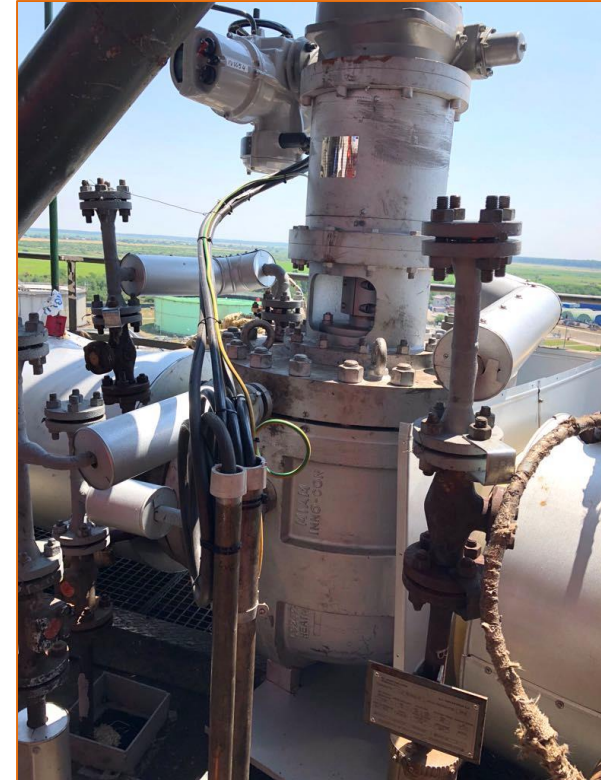
SUMMARY

INNO-CON with INNO-MAT®

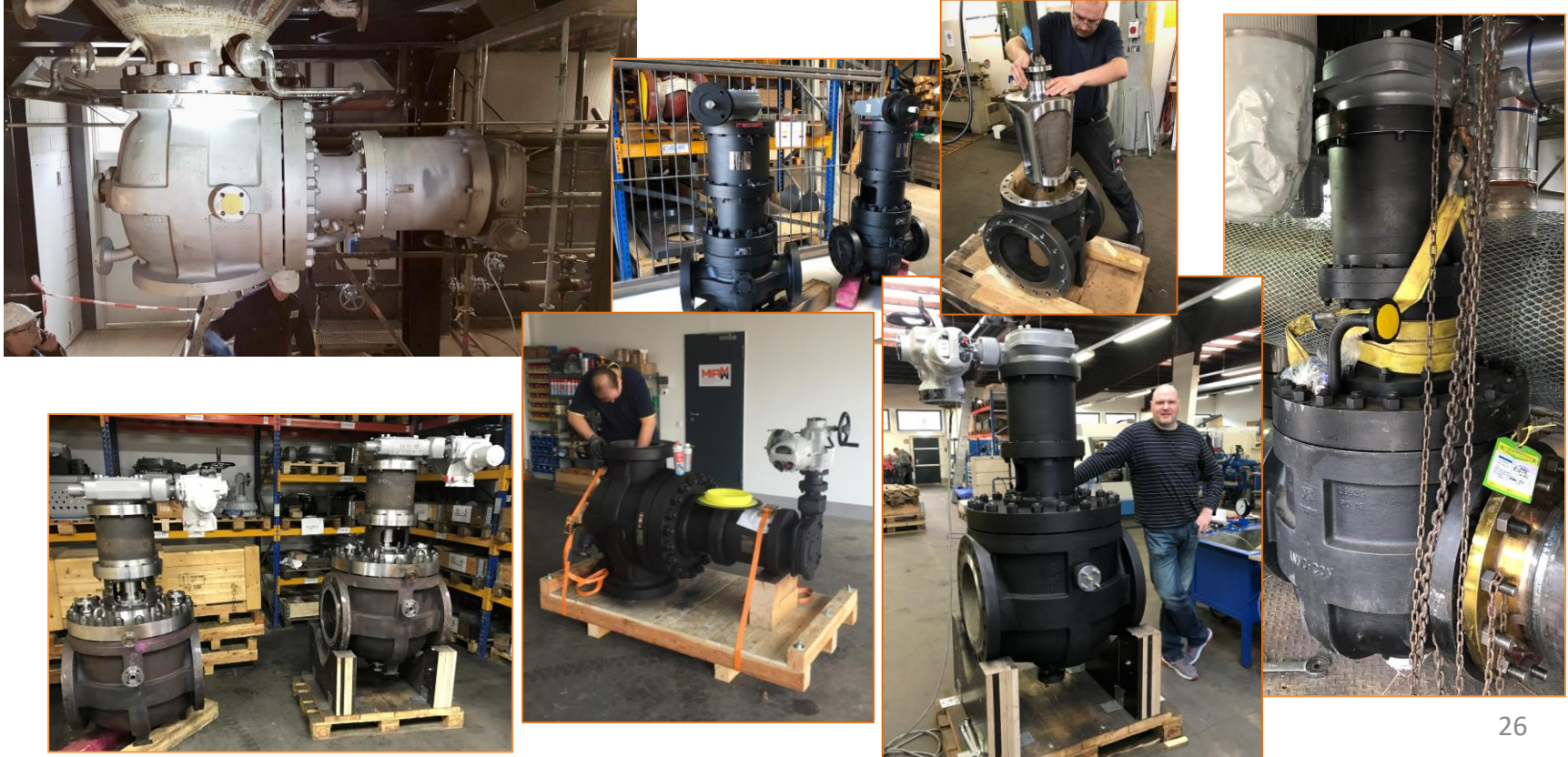
- Proven Reliability with INNO-MAT automation
- Simple top entry 3 part build up (Body, Plug, Bonnet)
- Torque seated
- Non friction on seats when operated
- Low maintenance requirements
- Low steam consumption



**Very Positive Value Proposition:
Reliability / Safety / Low Cost**



Proven by References Globally



Q & A

