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A Team Approach to Solving Control Valve Issues & Improved Reliability

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Agenda

- *Real Life Scenario*
- *Team Charter, Objectives, and Work Process*
- *Tools Developed and Used by the Team*
- *Success Stories*
- *Motiva at a Glance*

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Lights, Camera, ACTION!

Assembling The Team

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Valve Asset Improvement Team Charter

The Valve Asset Improvement Team champions the identification, evaluation and implementation of control and on/off automated valve asset-management strategies and solutions to improve safety, profitability, and reliability of Motiva's operating assets.

Team Objectives

- Provide a proactive approach to control valve management and improved reliability.
- Improve identification of bad actors and prioritize solutions including “QBRs.”
- Improve valve repair process to reduce repeat failures, ensure quality repairs, and to optimize maintenance cost.
- Improve performance and maintenance through proactive monitoring.
- Drive Risk-Based Inspection (RBI) analysis to optimize maintenance/inspection intervals.
- Improve the selection and specification of valves to ensure optimum performance and reliability.
- Build internal expertise and knowledge of valve design, application, damage mechanisms, and repair practices
- Monitor existing and future trends in the deployment of technology related to valve and actuator design, valve auxiliaries (e.g., positioners, solenoids, etc.), testing equipment and software, etc.

Valve Asset Improvement Work Process

- Develop process for identification of valve issues including potential impact to safety, profitability, or reliability.
- Develop a valve problem identification form.
- Work with all Motiva Business Units to generate current bad actors list.
- Develop solution recommendations with cost justification and present to Business Units.
- Track implemented recommendations.

Who sits on the Valve Team?

Motiva Senior Manager of Engineering and Technology

Motiva Manager / Instrumentation SME

Motiva Instrument Inspectors

Scallon Controls Account Manager

Fisher Global Industry Sales

Motiva Control Systems Engineers

Open seats for Maintenance, Turnaround, Instrument Inspectors, Control Systems Engineers, and other Scallon representatives depending on the meeting agenda.

Tools Developed by The Team

Control Valve Evaluation Form

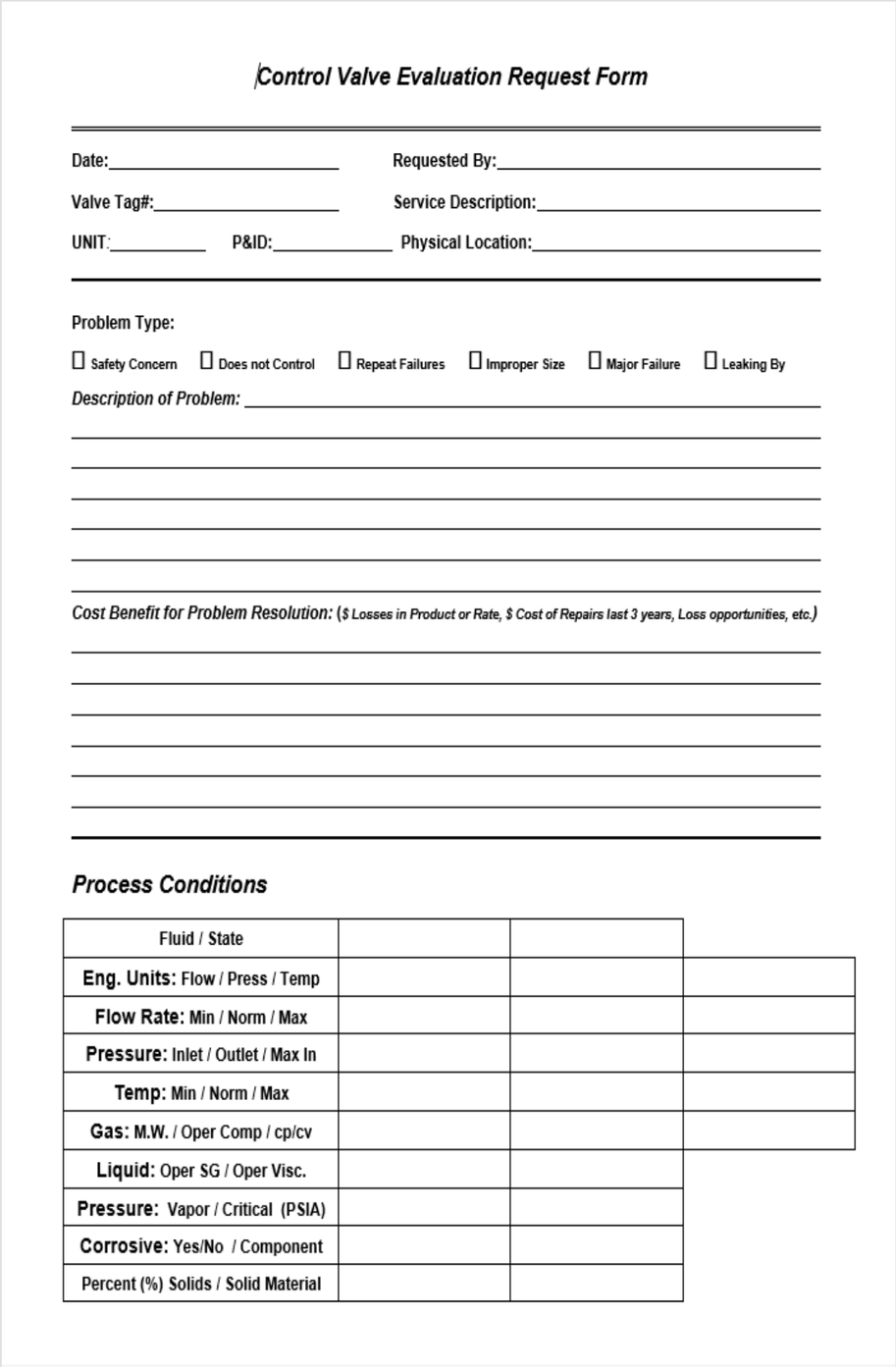
Valve Tracking Sheet

Bad Actor Spreadsheet

Turnaround Lookback Spreadsheet

Control Valve Evaluation Form

- Anyone at Motiva can access the evaluation form and submit to the valve team for review.
- Updated and accurate process conditions are imperative!
- The team's evaluation is not limited to severe service control valves.
  - Control Valves
  - Actuator Failures
  - Isolation Valves
  - Repair Standards
  - Piping Arrangements
  - Instrumentation on Valves



Control Valve Evaluation Request Form

Date:_____ Requested By:_____

Valve Tag#:_____ Service Description:_____

UNIT:_____ P&ID:_____ Physical Location:_____

Problem Type:

☐ Safety Concern ☐ Does not Control ☐ Repeat Failures ☐ Improper Size ☐ Major Failure ☐ Leaking By

Description of Problem: _____

Cost Benefit for Problem Resolution: (*$ Losses in Product or Rate, $ Cost of Repairs last 3 years, Loss opportunities, etc.*)

Process Conditions

Fluid / State			
Eng. Units: Flow / Press / Temp			
Flow Rate: Min / Norm / Max			
Pressure: Inlet / Outlet / Max In			
Temp: Min / Norm / Max			
Gas: M.W. / Oper Comp / cp/cv			
Liquid: Oper SG / Oper Visc.			
Pressure: Vapor / Critical (PSIA)			
Corrosive: Yes/No / Component			
Percent (%) Solids / Solid Material			

Valve Tracking Sheet

	Item	Tag	Service	Unit	Problem Type	Reported by	Brief Problem Description	Proposed Solution	Maintenance Cost	LPO	Estimated Implement Cost (TIC	Eval Form	Status	Remarks	Evaluation Period	Evaluation Start Date	Evaluation Finish Date	Result	Notes
					Problem Evaluation										Performance Evaluation				
20	X	9XV4201		CFH	Other	Holli Cruse	Needs overhaul/replacement	Not repeated failures identified on this valve. Scallon has quoted a Vanessa triple offset valve with RF flanges to replace the existing Tamoe valve.				N/A	Completed	Valve part of next TA scope. It's been requested evaluation from the CV Improvement Team.					
21	12	3LV1427		LHCU	Improper Size	Chris Sanchez	valve undersized for max condition/cavitation during Ultra 6 runs	Revise valve sizing and propose proper valve sizing.				Created	Evaluated	Two valve sizing options provided by Fisher/Scallon [MD 06/19/2024] Scallon proposed 4" notchflow and has provided quote. Waiting for site to make final decision. Requires piping modifications to install. (JS Dec2024) Valve has been quoted but no PO yet. Chris Sanchez is going to follow up with the business team to get a status update.					
22	13	2FV3006	MEORX	VPS5	Does not Contro	Justin Kelly	Control valve plugs almost immediately when placed in service. Flow can be established for a short while, then will lose flow over time. Valve has been removed from service, cleaned/overhauled, and placed back in service, while operating on the manual bypass, continuous flow is achieved, but with not adequate for control, as the bypass valve yields too	Proposed microscratch V-ball with Ceramic trim. This will allow opening of valve to flush trim. Ceramic provided to reduce material of sticking to trim.				Created	Evaluated	[MD 06/19/2024] Scallon quoted valve and working with Business team to get approval to proceed. (JS Dec2024) PO placed around September. Valve is scheduled to ship before the end of December. PO#7600209643.					
23	14	1HV7011/12/13	Emergency Steam	DCU2	Repeat Failures	Troy M.	Valve's diaphragms have being failing repeatedly over the years, which will cause dumping steam into the passes leading to back out charge and causing the Pana metrics flow meters to read erratically. Two fails since last TA	Replace actuators with 785C piston actuators. Return previously order 585C double acting actuators for restocking fee.				Pending	Evaluated	[MD 06/19/2024] Working through restock credit before making final order for new actuators. Will be replaced one at the time on the run. (JS Dec2024) The old 585C actuators have been returned to Fisher and Motiva has been credited 70% of the PO (minus the 30% restock.) Motiva has not purchased the new 785C piston actuators. Need to follow up with Jackson Schumacher and Philip Rogers to get					
24	15	4FV7011	HYDROGEN TO HEATER PASS A	HTU5	Does not Contro	Chris Sanchez	Does not control, Improper size. Unstable flow readings downstream of valve.						Completed	(JS Dec2024) Chris Sanchez is going to work with Mitch Murdock to add a delay to the 585 flow meter. From what the team has seen, this is not a valve issue.					

Dropdown Tables

Problem Type	Safety Concern	Does not Control	Repeat Failures	Improper Size	Major Failure	Leaking By	Other
Problem Evaluation Status	Evaluating	Evaluated	Implementing	Completed	Monitoring		
Performance Evaluation Status	In Progress	Passed	Failed				

Bad Actor Spreadsheet

- Scallon IT created a search engine/pivot table that could pull the tag numbers that were associated with work orders/repairs over the past 8 years.
- We were able to use this data to see how many times a valve had come in for repair and the year.
- We filtered this list to show the highest repeat offenders and reviewed the repair reports for those tags.
- From there, we were able to start identifying bad actors and have the valve team evaluate as needed.

Count of HIST_WO	Column Labels									
	2015	2016	2017	2018	2019	2020	2021	2022	2023	Grand Total
Tag / Object ID / Description										
N/A					3	2	1	1		7
NA						2	3			5
1HV7012				3	1					4
5PV3001A				2			1	1		4
9FV1076		1					1	2		4
3PV7592			3						1	4
FV0213	1	1	2							4
PCV193			1	1	2					4
FV0103		1	3							4
BV53					2			2		4
UNKNOWN					1		2	1		4
9LV1254A					4					4
2PV87			1	1	1					3
2SV1109 / 1A15910-3				1	1			1		3
5PV4048A				1		1	1			3
9FV1849			2	1						3
2PV8753					3					3
7TV7311					2			1		3
2FV0875			1	1	1					3
3FV9090A						3				3
30EV771H					3					3
3BV75	1	1		1						3
TV7211	1			1	1					3
TV7311					1		2			3
PV8202				2	1					3
TV3752							1	1	1	3
AV4795	1							1	1	3
multi						2	1			3
FV7713					3					3
PCV192			1	1	1					3
FV7652					2	1				3
2PV449		2								2
2FV0725				1	1					2
2HV0017				1	1					2
9FV1120				2						2
9FV1376		2								2

Turnaround Look Back Meetings

- In addition to the bi-weekly meetings, the team also has a turnaround look back meeting following every turnaround event.
- This meeting is to review all the valve repairs from the outage and filter out the tags that need to be investigated further.
- In addition to the original valve team members, we also include the turnaround planner, the unit instrument inspector, and the unit control systems engineer since they are the most familiar with the unit and equipment.
- Prior to the meeting Scallon complies the original valve serial cards, repair history, and the most recent repair reports for each tag.
- During the meeting the team reviews the documents and creates a spreadsheet that will be used for future meetings and evaluations.

Turnaround Look back Meetings

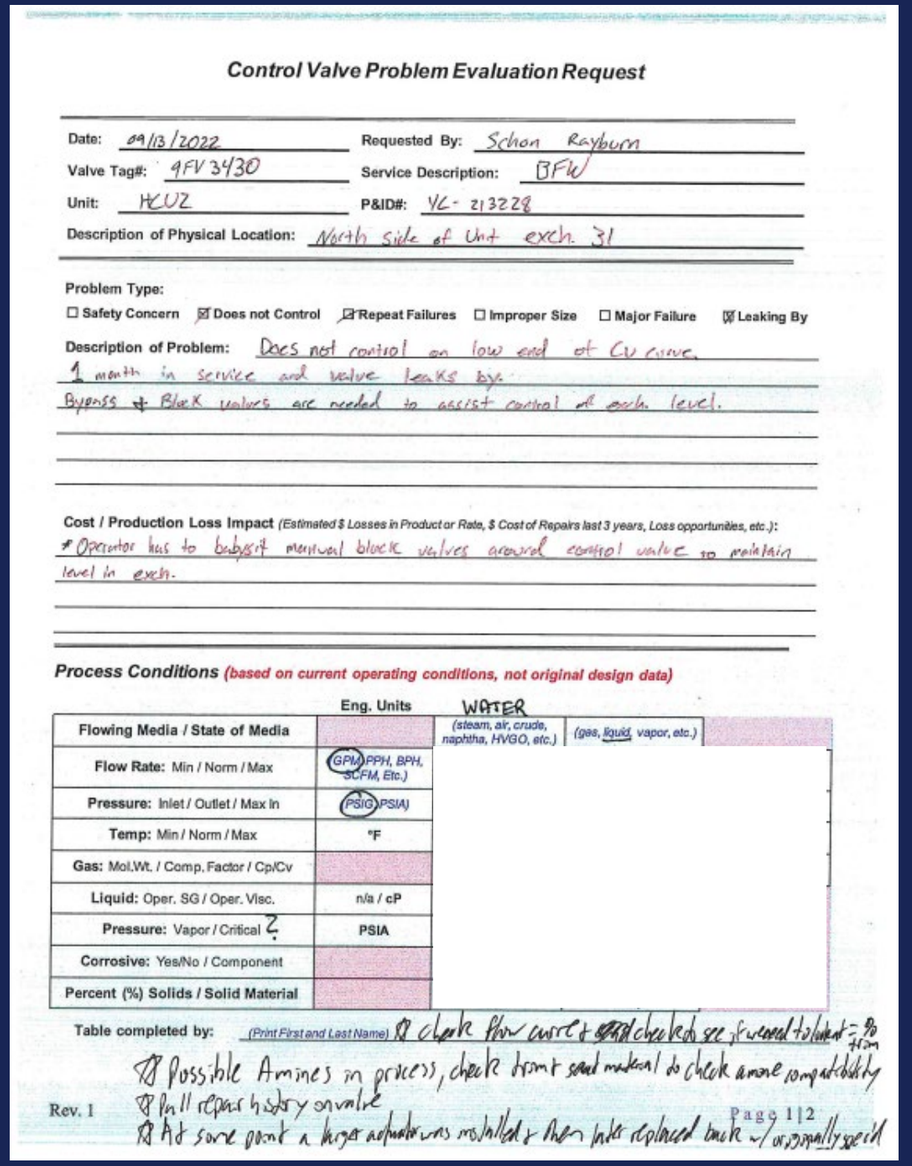
Customer PO#	SN#	Tag #	Description	Work Description	WO#	TSK#	Parts Ordered	PARTS RECEIVED DATE	Date Received	Unit	Date Repair Approved	Status/Projected Ship Date	Ship Date	Comments
7600144162	18682161	5FV7553	8" 150# ET / 667-70 with H/W / DVC6010F / Westlock Quote 1st Class Repair with Trim and OT.	1st Class Repair with Trim & OT	45739	116154	6/13/2022	10/22/2022	3/12/23	ARU5	3/15/23	3/21/23		Original built 2008. New valve installed 2023
7600158677	18694199	5FV7554A	12"X 8" EWT, 667 SZ. 70, DVC Quote 1st class repair with Trim and OT Joe Wants the DVC Upgraded	12"X 8" EWT, 667 SZ. 70, DVC Quote 1st class repair with Trim and OT	45739	122217	12/5/2022		3/12/23	SRU7	3/17/23	3/22/23		Original built in 2008. Overhauled on 2023
7600158677	18694200	5FV7554B	12"X 8" EWT, 667 SZ. 70, DVC Quote 1st class repair with Trim and OT Joe Wants the DVC Upgraded	12"X 8" EWT, 667 SZ. 70, DVC Quote 1st class repair with Trim and OT	45739	122218	12/5/2022		3/12/23	SRU7	3/17/23	3/19/23	3/19/23	Original built in 2008. Overhauled on 2023
7600144162	18767917	5FV7556	6x4" 300# EWT / 657-45 with H/W / DVC6010F Quote 1st Class Repair with Trim and OT.	1st Class Repair with Trim & OT	45739	116156	6/13/2022	10/22/2022	3/12/23	ARU5	3/14/23	3/15/23		Trim replced in 2018
7600144162	19218408	5FV7561	14" 150# A31A / Bettis G01010SR4CW / DVC6030F / 67DFR / Westlock / ASCO HV264700-004 24v Quote 1st Class Repair with Trim and OT.	1st Class Repair with Trim & OT	45739	116157	6/13/2022	10/22/2022	3/12/23	ARU5				
7600144162	18681556	5FV7565	14" 150# A31A / Bettis G01010SR4CW / DVC6030F / 64R / 262K Filter / Westlock / ASCO HV264700-004 24v Quote 1st Class Repair with Trim and OT.	1st Class Repair with Trim & OT	45739	116158	6/13/2022	11/1/2022	3/12/23	ARU5				
7600144162	18722408	5FV9019	8" V150 / 1052-40 / DVC6020F / Westlock / Asco HV3647004 / QTY (2) 67CFR Quote 1st Class Repair with Trim and OT.	1st Class Repair with Trim & OT	45739	116159	6/13/2022	10/22/2022	3/12/23	SRU7	3/16/23	3/20/23	3/20/23	
7600144162	18741211	5FV9025A	20" 150# A31A / Bettis G2012SR4CW / DVC6020F / 64R / 262K Filter / Asco HV264700-004 24v (X2) Quote 1st Class Repair with Trim and OT. .	1st Class Repair with Trim & OT	45739	116160	6/13/2022	10/22/2022	3/12/23	SRU7	3/14/23	3/23/23	3/23/23	
7600144162	18737361	5FV9025B	8" V150 / 1052-60 / DVC6020F / Westlock / Asco HV3647004 / QTY (2) 67CFR Quote 1st Class Repair with Trim and OT. . Remove the SOV from the assembly.	1st Class Repair with Trim & OT	45739	116161	6/13/2022	10/22/2022	3/12/23	SRU7	3/13/23	3/18/23	3/18/23	Original built in 2008. replaced softgoods as part of TAR in 2016, then overhauled in 2023
7600144162	18741946	5FV9030A	20" 150# A31A / Bettis G01010SR4CW / DVC6020F / 64R / 262K Filter / Asco HV264700-004 24v (X2) Quote 1st Class Repair with Trim and OT. . Remove the SOV from the assembly.	1st Class Repair with Trim & OT	45739	116162	6/13/2022	11/1/2022	3/11/23	SRU7	3/13/23	3/19/23	3/19/23	Original built in 2008. overhauled in 2023
7600144162	18611874	5FV9030B	8" V150 / 1052-60 / DVC6020F / Westlock / Asco HV3647004 24v Quote 1st Class Repair with Trim and OT. . Remove the SOV from the assembly.	1st Class Repair with Trim & OT	45739	116163	6/13/2022	10/22/2022	3/11/23	SRU7	3/13/23	3/21/23		Original built in 2008. overhauled in 2023
7600144162	18583853	5FV9215	6" 150# ET / 667-70 / DVC6010F / Quote 1st Class Repair with Trim and OT.	1st Class Repair with Trim & OT	45739	116171	6/13/2022	10/22/2022	3/11/23	TGTU7	3/13/23	3/17/23	3/17/23	Original built in 2008. overhauled in 2023
7600144162	18798882	5FV9373	36" 150# A11 / Bettis G3016SR2CW / DVC6020F / 64R / 262K Filter / Asco HV264700-004 24v Quote 1st Class Repair with soft goods OT. Trim not available . Remove the SOV from the assembly.	1st Class Repair with OT	45739	116164	6/13/2022	10/22/2022	3/10/23	SRU7	3/13/23	3/16/23	3/16/23	Original built in 2008. overhauled in 2023. upgraded to Graphite packing
7600144162	18798883	5FV9374	30# 150# A11 / Bettis G3016SR2CW / DVC6020F / 64R / 262K Filter / Westlock / Asco HV264700-004 24v Quote 1st Class Repair with Trim and OT. . Remove the SOV from the assembly.	1st Class Repair with Trim & OT	45739	116165	6/13/2022	1/31/2023	3/10/23	SRU7	3/13/23	3/16/23	3/16/23	Original built in 2008. overhauled in 2023
7600144162		5HV9108	36" 150# Adams MAK16 /G7036-SR3-M11/ ASCO 8316/TW Quote 1st Class Repair with Trim and OT.	1st Class Repair with Trim & OT	45736	116147	6/13/2022	9/20/2022	3/14/23	SRU7	3/16/23	3/23/23	3/24/23	
7600144162	90024	5HV9109	30" 150# Adams MAK16 / Bettis G7028SR / Westlock / ASCO Quote 1st Class Repair with Trim and OT.	1st Class Repair with Trim & OT	42736	116150	6/13/2022	9/20/2022	3/14/23	SRU7	3/17/23	3/23/23	3/23/23	
7600168937	18602770	5LV7552	10"x8" 300# EWT, 667 SZ. 80, DVC	1st class Repair with Trim & OT	52859	126012	3/17/2023		3/17/2023		3/22/2023	3/25/2023	3/24/2023	Original built in 2008. Actuator repairs in 2018. Overhauled in 2023
7600144162	18703587	5PCV166	2" 150# 1098-451 EGR / 6353 Pilot 3-40 Range Quote 1st Class Repair with Trim and OT.	1st Class Repair with Trim & OT	45739	116169	6/13/2022	10/22/2022	3/11/23	SRU7	3/13/23	3/18/23	3/18/23	

Success Stories

Hydrocracker Boiler Feed Water Valves

Initial Investigation

- Original Valves were 2in 600# Fisher ET with CAV III trim.
- Valves were designed to have class IV shut off but they were leaking multiple gallons per minute.
- Valves did not control well on low end of curve.
- Bypass valves and block valves were being used to assist in controlling the level due to the issues with the control valve.
- The main issue being that the valve was operating below its minimum Cv (Min Cv=3.9) at the minimum flow case. There is no cavitation protection/controllability when throttling below a CAVIII trim minimum Cv.
- 730psi pressure drop (880psi upstream and 150psi downstream.)



Control Valve Problem Evaluation Request

Date: 09/13/2022 Requested By: Schon Rayburn

Valve Tag#: 9FV 3430 Service Description: BFW

Unit: HCU2 P&ID#: VC-213228

Description of Physical Location: North Side of Unit exch. 31

Problem Type:

☐ Safety Concern ☒ Does not Control ☒ Repeat Failures ☐ Improper Size ☐ Major Failure ☒ Leaking By

Description of Problem: Does not control on low end of Cv curve. 1 month in service and valve leaks by. Bypass & Block valves are needed to assist control at each level.

Cost / Production Loss Impact (Estimated $ Losses in Product or Rate, $ Cost of Repairs last 3 years, Loss opportunities, etc.): * Operator has to babysit manual block valves around control valve to maintain level in exch.

Process Conditions (based on current operating conditions, not original design data)

	Eng. Units	WATER (steam, air, crude, naphtha, HVGO, etc.) (gas, liquid, vapor, etc.)
Flowing Media / State of Media		
Flow Rate: Min / Norm / Max	(GPM) PPH, BPH, SCFM, Etc.)	
Pressure: Inlet / Outlet / Max In	(PSIG) PSIA)	
Temp: Min / Norm / Max	°F	
Gas: Mol.Wt. / Comp. Factor / Cp/Cv		
Liquid: Oper. SG / Oper. Visc.	n/a / cP	
Pressure: Vapor / Critical ?	PSIA	
Corrosive: Yes/No / Component		
Percent (%) Solids / Solid Material		

Table completed by: (Print First and Last Name) ☒ check flow curve ~~and~~ checked to see if exceed tolerance = 2% from ☒ Possible Amines in process, check trim seal material to check amine compatibility ☒ Pull repair history on valve ☒ At some point a larger actuator was installed & then later replaced back w/ originally sized

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Hydrocracker Boiler Feed Water Valves

The Solution

- The team’s recommendation was a Fisher Notchflo DST (3-stages) for the following reasons.
- Stage the pressure drop and eliminate the cavitation
- Leverage the Notchflo’s protected seat and set the min travel cutoff in the DVC as added protection.
- If we reused the current SZ46 667 with spring 1E8263[1870], the bench set will be 7.5-12psi. Considering the NotchFlo DST’s 3/8” travel, the control resolution would be poor.
- With this said, we asked if Motiva would be opposed to changing the actuator to a 667 SZ45. Here we would use spring 1E8255 [3320] with a bench set of 18-30psi. The increased span with this option would provide better control resolution.

CFH CHPS Valve

Initial Investigation

- Existing valve is a 3in Notchflo DST (4-stage)
- Valve had severe high frequency vibration around the stem which resulted in multiple positioner bracket failures bringing the valve to fail position on several occasions.
- Valve experienced several packing leaks due to stem vibration
- During one of the repairs the trim was extremely worn and plug seals were completely missing.

CFH CHPS Valve

What we found

- Due to a debottlenecking project the outgassing outlet volume ratio went from .2 to .8
- The valve position was originally around 40% in 2015 and steadily increased year over year until the debottleneck in 2019 where position jumped to 80-90%.
- The original Notchflo was designed to combat cavitation. Since the outlet volume gas ratio drastically increased we discovered that we needed a valve that could combat the aerodynamic noise issue due to the challenging outgassing scenario.
- We also used Emerson's wireless vibration monitor to build a business case for the replacement.

FISHER **Out-Gassing Application Process Data Sheet** | Sheet of | Rev:

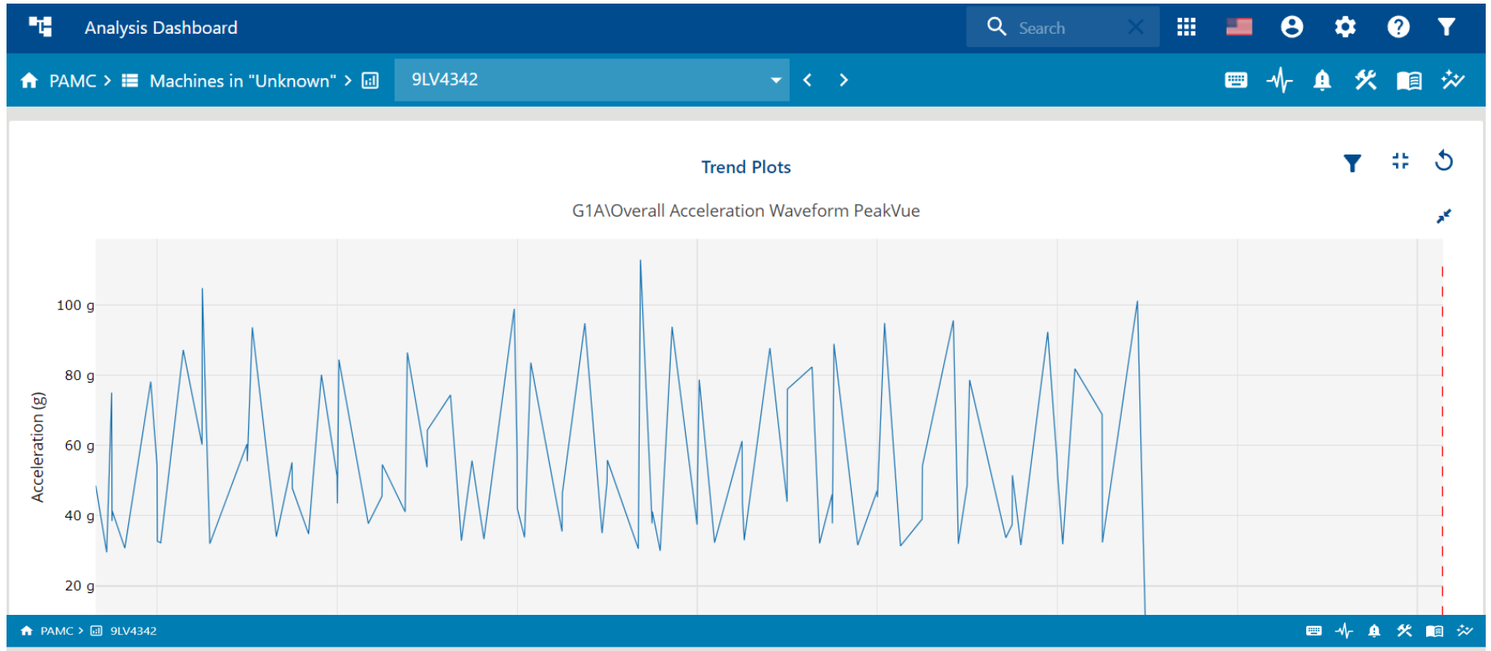
General	1	Customer:	MOTIVA			
	2	Project	N/A			
	3	Tag Number	9LV4342			
	4	Service	Cold High Pressure Separator Boot			
	5					
	6	Line Size / Schedule	Inlet	4" Sch 120	Outlet	6" XS
	7	Valve Style	Globe / Angle / Rotary			
	8					
Process Operating Conditions	9		Units	Operating Condition		
	10			Minimum	Normal	Maximum
Inlet Conditions	11	Pressure	psig			
	12	Temperature	°F			
	13	Mass Flowrate, Vapor	lb/hr			
	14	Vapor Density††				
	15	Vapor MW				
	16	Mass Flowrate, Liquid	lb/hr			
	17	Liquid Density††	S.G.			
	18	Mass Flowrate, Total	lb/hr			
	19	ΔP	psi			
Outlet Conditions(†)	20	Pressure	psig			
	21	Temperature	°F			
	22	Mass Flowrate, Vapor	lb/hr			
	23	Vapor Density††	lb/ft3			
	24	Vapor MW				
	25	Mass Flowrate, Liquid	lb/hr			
	26	Liquid Density††	S.G.			

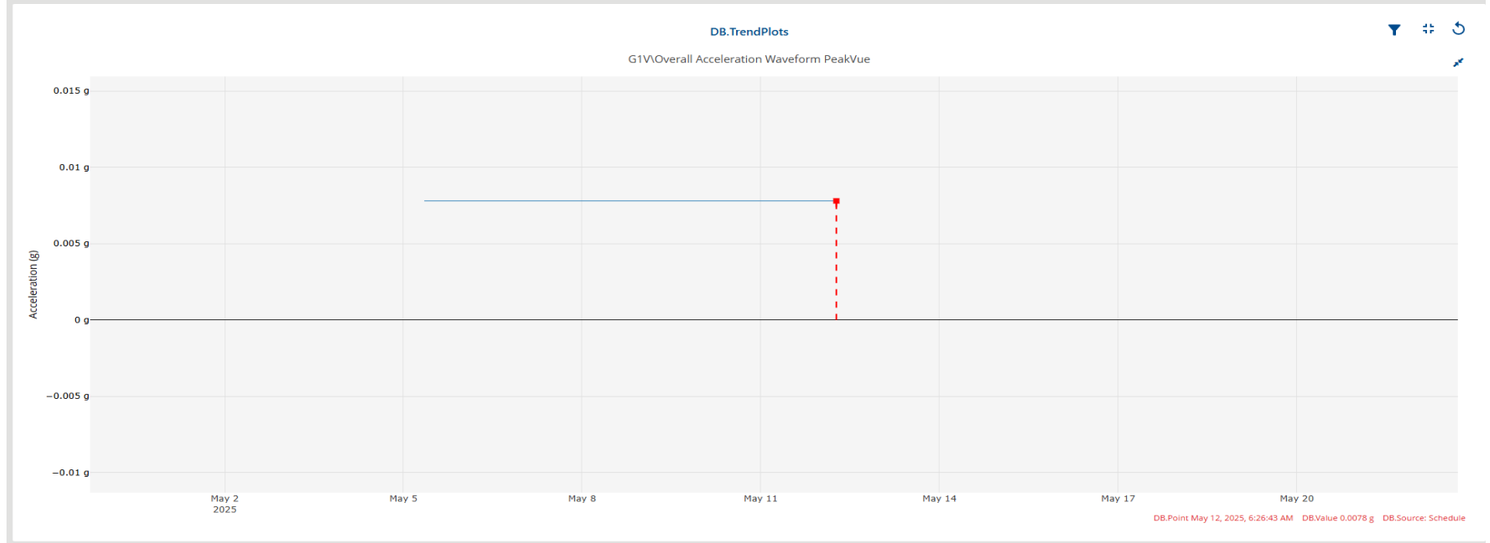
CFH CHPS Valve

The Solution – “The Whisper Tank”

- Current Issue - Increased gas exiting the valve causing higher frequency vibration; aerodynamic noise likely contributing more than cavitation.
- Original Design - Sizing based on cavitation handling, not aerodynamic noise (Notchflo was selected for cavitation).
- Solution - Switch to a Fisher HPAS single-stage whisper A1 solid alloy cage with drilled holes for better noise abatement and reduced stem vibration.
- Trim Update - New trim installed in existing block-forged body to avoid piping modifications.
- Stem/Plug Assembly - Machining a one-piece stem/plug (instead of pinning) for added strength, reduced vibration, and eliminated risk of plug detachment.
- Actuator Sizing - Double-acting piston actuator with volume tank for better plug stability and reduced vibration.
- DVC Mounting - Plan to eventually remote-mount the DVC on a pipe stand to protect from unnecessary vibration.
- Additional Benefit - Going unbalanced eliminates the balanced plug seal and seal ring, removing a potential failure point.

CFH CHPS Valve





Extremely Noisy Naphtha Valve

Initial Investigation

- A 4in Vee ball was sold to replace a 6in E body as a low cost solution
- Based on original conditions, sizing did not show any noise concerns
- Once installed the valve was extremely noisy (some readings as high as 110dB)
- The 4in Vee ball was sized, quoted and replaced under normal maintenance practices with no concerns or red flags until the valve was installed

Control Valve Problem Evaluation Request

Date: 6/28/2023 **Requested By:** Nikos Poulassichidis

Valve Tag#: 6FV6378 **Service Description:** Light Naphtha

Unit: 27PH **P&ID#:** YC-216858

Description of Physical Location: Along 4th Avenue close to the intersection with Kinnear

Problem Type:

☐ Safety Concern ☐ Does not Control ☐ Repeat Failures ☒ Improper Size ☐ Major Failure ☐ Leaking By

Description of Problem: As we approach the max flow running through this recirc valve, a loud cavitating noise can be heard through this valve.

Cost / Production Loss Impact *(Estimated $ Losses in Product or Rate, $ Cost of Repairs last 3 years, Loss opportunities, etc.)*:
This valve was purchase and installed late 2022 to resolve the cavitation.

Process Conditions *(based on current operating conditions, not original design data)*

	Eng. Units			
Flowing Media / State of Media		Light Naphtha	*liquid*	
Flow Rate: Min / Norm / Max	BPH			
Pressure: Inlet / Outlet / Max In	PSIG			
Temp: Min / Norm / Max	°F			
Gas: Mol.Wt. / Comp. Factor / Cp/Cv				
Liquid: Oper. SG / Oper. Visc.	n/a / cP			
Pressure: Vapor / Critical	PSIA			
Corrosive: Yes/No / Component				
Percent (%) Solids / Solid Material				

Table completed by: Nikos Poulassichidis

Extremely Noisy Naphtha Valve

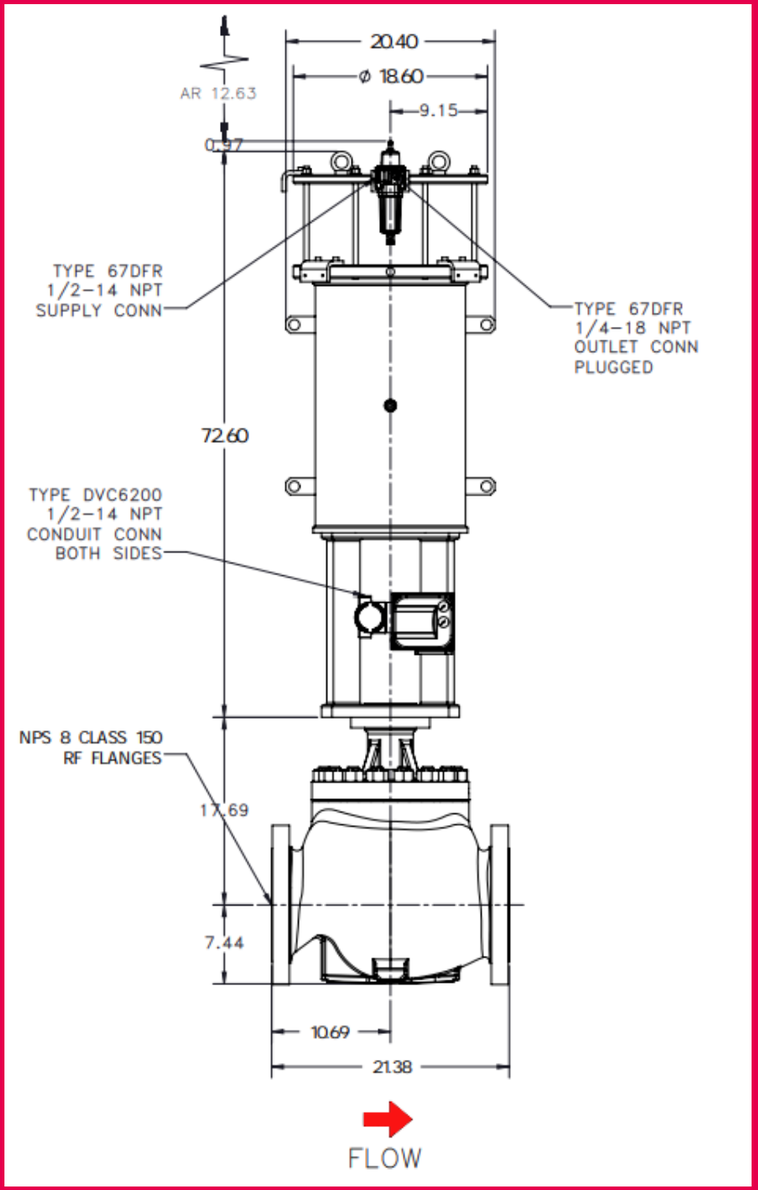
What we found

- After the 4in Vee ball was installed and reported to be very noisy, we planned a field walk to evaluate the installation.
- The piping arrangement was far from ideal. Upstream piping was 12in, then 8in and then swaged down to 4in at the valve.
- Immediately downstream of the valve was a pipe elbow and then swaged back up to 8in and then 12in pipe.
- Since this is a blending valve the amount of flow through the valve depends on the amount of Naphtha needed in the blend.
- Due to the piping arrangement and gathering updated process conditions we determined that a larger valve with pressure staging and noise attenuation would be needed.
- We also used Emerson’s wireless vibration monitor to build a business case for the replacement.

Extremely Noisy Naphtha Valve

The Solution

- Upsize the valve to 8in to match the larger upstream/downstream piping and reduce the amount of swages.
- Relocate the valve to include at least 10 upstream/downstream pipe diameters to provide a better straight run of piping.
- New piping with improved flow regime and thicker wall SCH XS piping to stabilize flow and further reduce noise.
- The final valve design is a Fisher 8X6 EWT with CAVIII 2 stage trim and spring return 785C actuator.
- Between the CAVIII trim, the piping changes, and relocation of the valve we are calculating around a 40dB noise reduction.
- Staging the pressure drop across the two stage globe valve will also help noise and cavitation issues.



Motiva Overview

Headquartered in Houston, Texas, Motiva refines, distributes, and markets petroleum products throughout the Americas.

MOTIVA

Member of the Aramco Family

- Motiva is an **American company** that operates as an affiliate of Aramco
- Aramco is **one of the world's largest** integrated energy and chemical companies
- Aramco has more than **70,000 employees** operating in Asia, Europe, and North America

Aramco creates value across the hydrocarbon chain and delivers societal and economic benefits to communities around the globe that rely on the vital energy supplied.

Fuels

North America's Largest Refinery

- Total throughput of **720,000 barrels** per day
- Produces **569,000 barrels** of fuels daily
- Manufactures **gasoline**, **diesel**, **jet fuel**, and other products

Our Port Arthur refinery is one of the largest and most flexible refineries in the world. As part of our Port Arthur Manufacturing Complex, the refinery plays a vital role in producing fuels that are used by consumers throughout the Americas.

Base Oils

Industry-Leading Capacity and Flexibility

- **Largest lubricants** plant in Western Hemisphere
- Base oil capacity of **40,000 barrels** each day
- Enough to change oil in ~**1.3 million** cars daily
- Part of the **Aramco Global Base Oils Alliance**

As the second largest lubricants producer in the world, Motiva supplies aramcoPRIMA and aramcoULTRA base oils both domestically and to more than 15 countries. Motiva supplies a wide range of customers, providing base oils used in the manufacturing of automotive and industrial lubricants.

Fuel Sales & Marketing

Reliable Supply of Quality Products

~12 BILLION

gallons of fuel
supplied annually

We proudly distribute two exceptional fuel brands to retailers across the country. Both Shell and 76® allow us to deliver on a double promise of reliable supply and quality products. In addition, Motiva is a full-service marketer and distributor of unbranded gasoline and diesel.

EMERSON EXCHANGE 2025
ACCELERATING INNOVATION

Exhibit # 2-1418

Find More Information

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Thank You