Way forward for control valve in Produced water system

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23 Jun 2020

PTTEP

30 YEARS

EMPOWERING OPPORTUNITIES

ay forward for control valve in produced water system

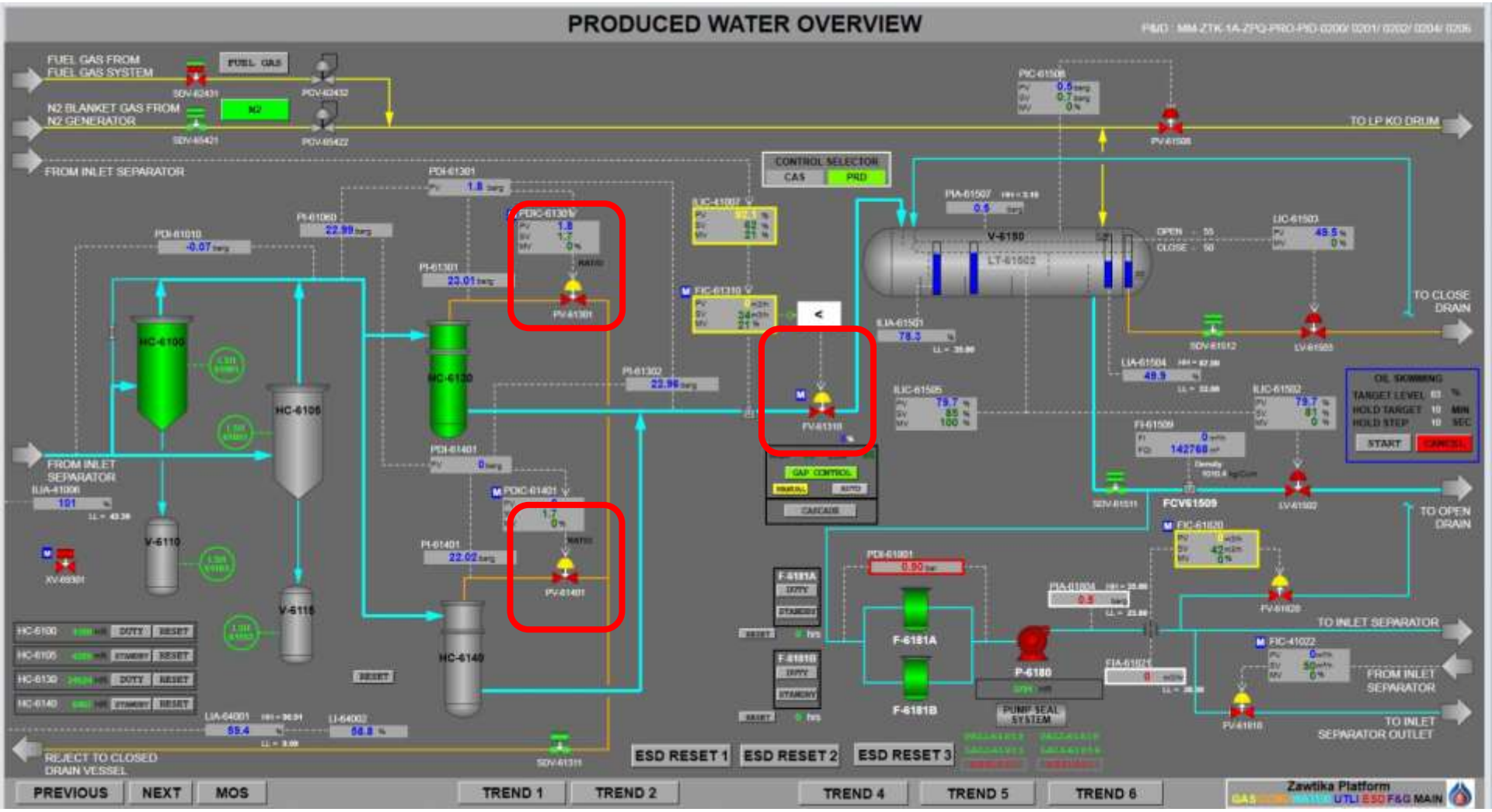
Background

FV-61310, PV-61301 and PV-61401 are frequently reported internal passing by production. Base on the historical information, the original material life time around one year or less.
As these 3 valves are critical for operation and effect on plant control, operation expect no passing at all or very low rate of passing. Nevertheless control valve design is not tight shut-off and some passing is expect after operation.
Due to the operating condition is differ from the original design that higher rate of water production is expected, there is no shut-off valve in this line. Thus operation has been using these 3 control valves for isolation.

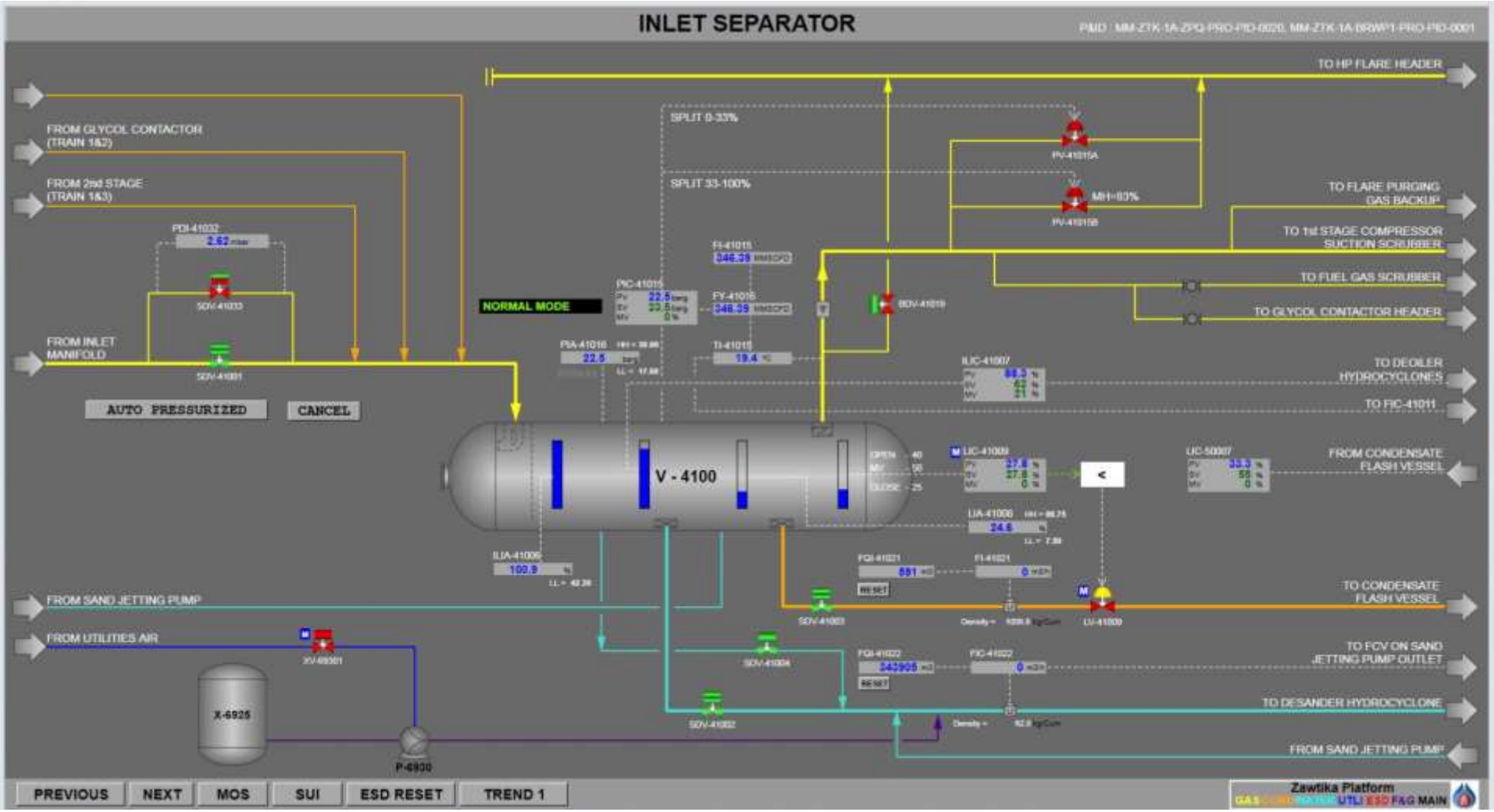
Purpose of this meeting

- To use fact for evaluation of proper solution
- To find mutual agreement of valve operation between Operation and Maintenance
- To identify acceptable passing rate that allow operability and optimize maintenance cost

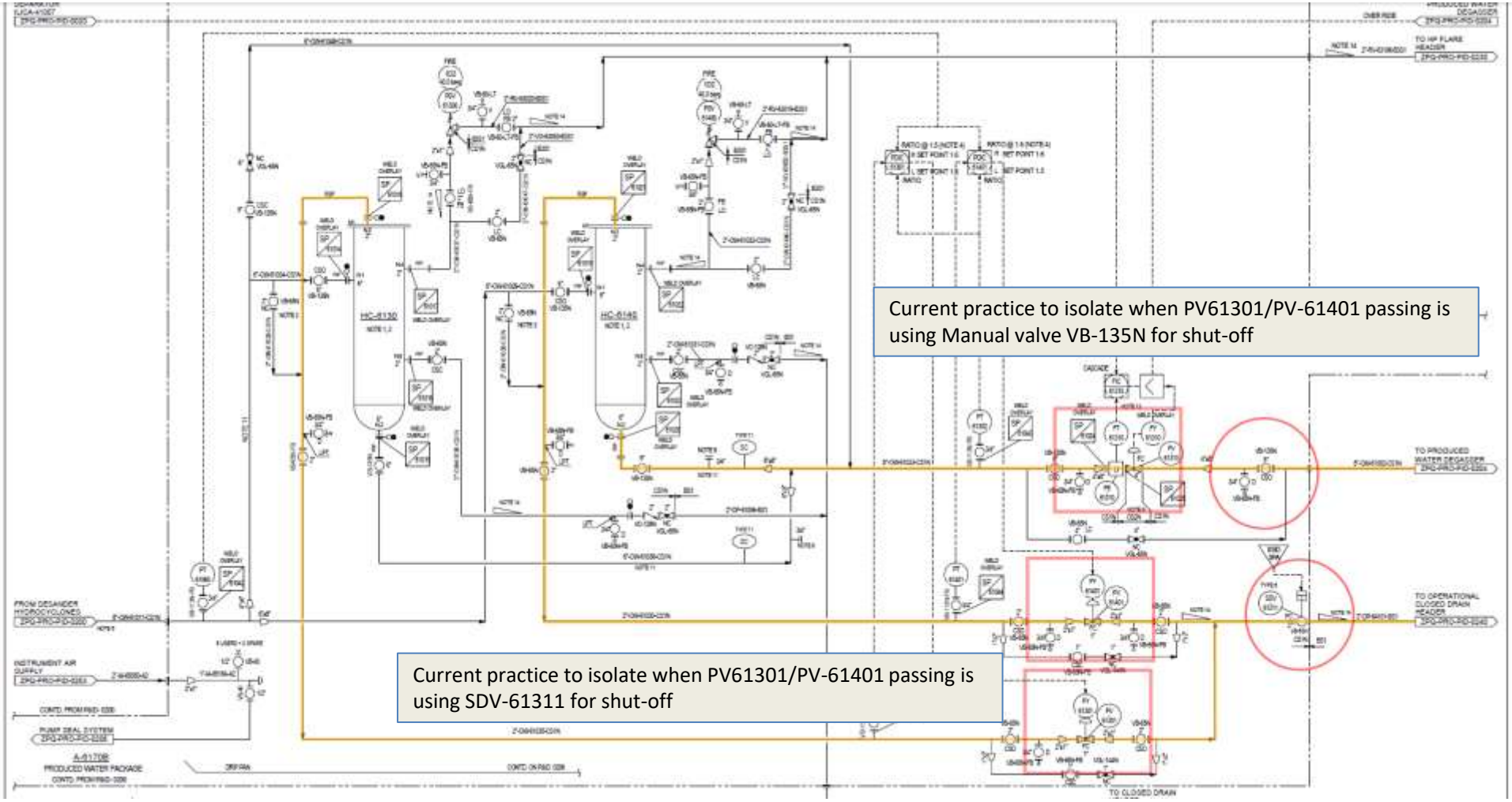
Process flow diagram



Process flow diagram



Process flow diagram



PCV-61301 time line

REFERENCE : SAP WORK ORDER, MAINTENANCE DAILY REPORT, E-MAIL RECORD

Original trim kit cost 5,876 USD per set in 2

2015 — 2016 — 2017 — 2018 — 2019 — 2020

7 July 2015
Valve passing

9 Feb 2016
Valve repair

25 Feb 2017
Valve passing

20 Aug 2017
Valve passing

9 Feb 2019
Valve overhaul

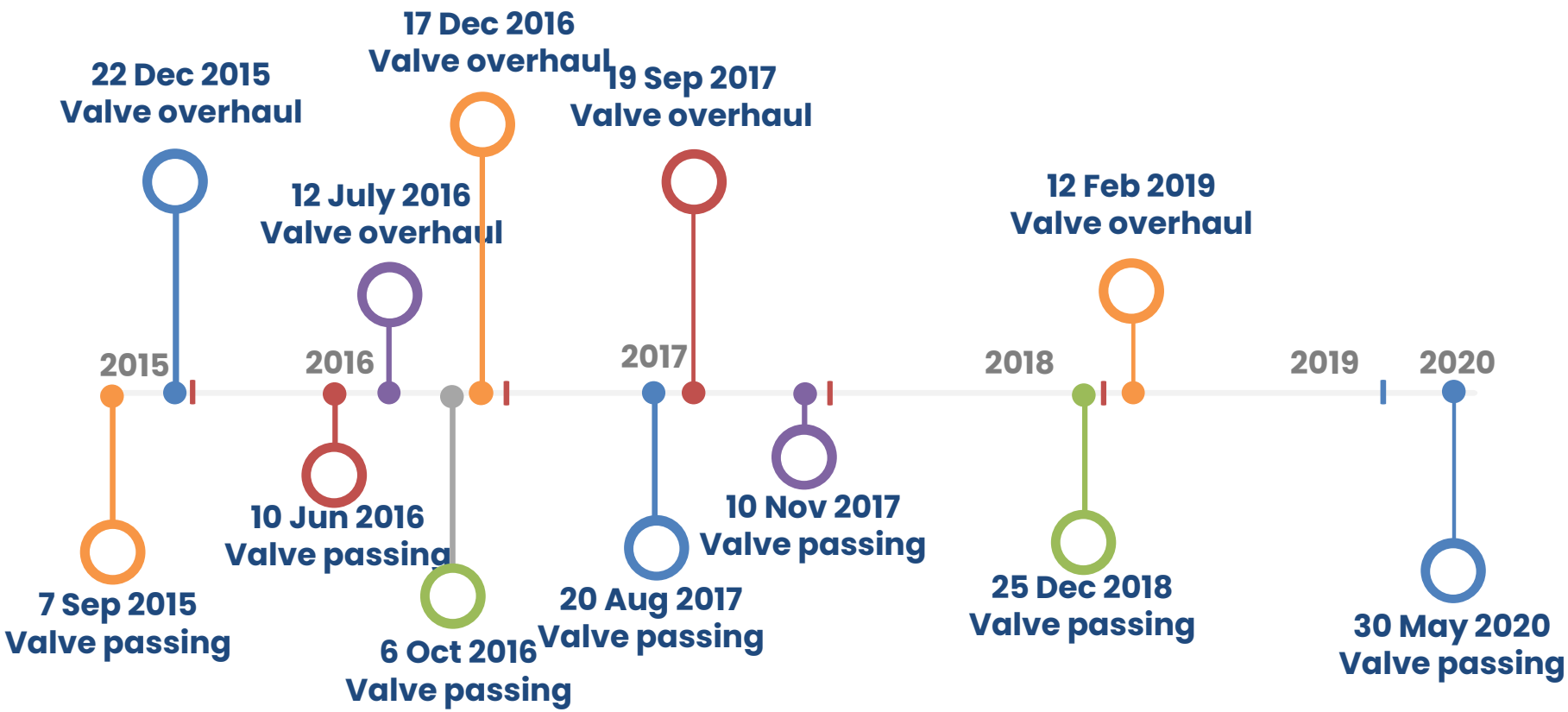
25 Dec 2018
Valve passing

30 May 2020
Valve passing

PCV-61401 time line

REFERENCE : SAP WORK ORDER, MAINTENANCE DAILY REPORT, E-MAIL RECORD

Original trim kit cost 5,876 USD per set in 2



FCV-61310 time line

REFERENCE : SAP WORK ORDER, MAINTENANCE DAILY REPORT, E-MAIL RECORD

Original Trim kit cost 22,282 USD per set in

6 May 2015
Valve overhaul

24 Dec 2016
Valve overhaul with ceramic material

5 Mar 2019
Remove and found valve condition good with some scratch

2014 2015 2016 2017 2018 2019 2020

8 Nov 2014
Valve passing

11 Jan 2016
Valve passing

1 Apr 2016
Valve passing 3 m3/hr

18 Aug 2016
Valve passing

28 Mar 2017
Valve passing

25 Dec 2018
Valve passing

30 M 202
Valve passing 4 m3/hr

Brainstorm solutions

Fact

- Either of these valves passing will result in liquid loss from inlet separator.
- Operation current practice when **PCV-61301/PCV-61401** passing is using **SDV-61311** to isolate. While using manual valve VB-135N to isolate in case of **FCV-61310** passing.

- **PCV-61301/PCV-61401** Original trim kit cost 5,876 USD per set in 2014. Require 36 Manhour for overhaul.
- **FCV-61310** Original Trim kit cost 22,282 USD per set in 2014. Require 48 Manhour for overhaul.

Estimation

- Modify Manual block valve VB-135N to allow remote operation cost around 150,000 – 170,000 USD
- Consider escalation 5% per year for spare part, PCV-61301/PCV-61401 should cost about 7,640 USD
- Consider escalation 5% per year for spare part, FCV-61310 should cost about 33,000 USD

Idea

- Modify Manual block valve VB-135N to allow remote operation
- Upgrade material of control valve
- Add shut-off valve
- What is the proper passing rate to trigger overhaul?

WEIR CONTROL & CHOKE VALVES — Technical Specification Sheet

Customer	PROCESS GROUP	WVC Order No.	
Customer Ref.	4963	Line No.	2"-OW-61030-CS1N
Customer Item No.	PV-61301 / PV-61401	Quotation No	30033346/0020
Customer Enquiry/Order No.	CONTROL VALVES	Quantity	2
Project Title	ZAWTIKA - PRODUCED WATER PACKAG	Sales Engineer	Weir Valves & Controls UK Ltd
Application	Standard	Valve Code	25-502-300-A102A-MF- A61ADB4MC

ITEM	REV	DESC						
			Program Version	5.8.0				
			Service Medium: Water with oil		Phase: Liquid			
1	A	PROCESS DATA	**Condition**		1	2	3	
2	C		Liquid Flow Rate	m³/h	2.33	2.33	2.12	
3	C		Inlet Pressure	barg	2.8	6.2	9.3	
4	A		Outlet Pressure	barg	0.5	0.5	0.5	
5	C		Pressure Drop	bar	2.3	5.7	**8.8**	
6	A		Inlet Temperature	℃	20	40	40	
7	C		Specific Gravity		1.012	0.997	**0.997**	
8	C		Vapour Pressure	bar(a)	0.023	0.074	0.023	
9	A		Critical Pressure	bar(a)	221.3	221.3	221.3	
10	C		Viscosity	Centi-Poise	1.002	0.651	**0.651**	
11								
12	D		Calc Cv	US Units	1.79	1.13	0.828	
13	C		SPL @ 1m	dBA	<60	<60	<60	
14	C		Valve Travel	%	72	60	52	
15	C		Inlet Velocity	m/sec	1.28	1.28	1.16	
16	C		Outlet Velocity	m/sec	1.28	1.28	1.16	
17		DESIGN	Design: Press / Temp		40barg		-29℃ / 75℃	
18	B		Shut-Off Pressure		40bar			
19	D		Inlet Pipe Size / Schedule		50 mm (2")		Shd 160	
20	D		Outlet Pipe Size / Schedule		50 mm (2")		Shd 160	
21			Pipe Insulation Thickness		None			
22		BODY/BONNET ASSEMBLY	Valve Range / Model		BV 502			
23			Body Type/Style		Globe			
24			Nominal Valve Size		25 mm (1")			
25			Body Rating		ASME 300			
26	D		Inlet Size / Connection		25 mm (1")		Flanged R/F	
27	D		Outlet Size / Connection		25 mm (1")		Flanged R/F	
28			Body Material		ASTM A216 WCB			
29			Bonnet Style		Standard			
30			Bonnet Material		ASTM A216 WCB			
31	C		Body / Bonnet Bolting		B7/2H hot dip galvanized to ASTM A153			
32			Gasket Material		316 L ST.ST. / GRAPHITE			
33	C		Gland Packing Type		PTFE Chevrons			
34			Ind. Spec: Wetted Parts		NACE			
35	C	TRIM DESIGN	Trim Type / Trim Size		Multi-Flow		MF3	
36	D		Valve Design Cv		5.6			
37			Flow Direction / Characteristic		Over		Eq%	
38	D		Plug Design / Plug Seal Ring		Solid	None		
39			Plug Material		316L ST.ST. + Gr.6 Stellite Face			
40			Guide Material		17/4 PH ST.ST.			
41			Seat Material		316L ST.ST. + Gr.6 Stellite Face			
42			Leakage Class		IEC 60534-4 Class IV			
43			Stem Diameter / Material		10 mm		316L ST.ST.	
44			Silencer					
89	D	OTHER DETAILS	- 316SS tag plate & name plate required - Bolts/Nuts: B7/2H hot dip galvanized to ASTM A-153 - Valve body & actuator to be painted per S01 of ZGS-COR-301 - RF B16.5, smooth finish with roughness between 250-500µ-inch - 3/8" SS 904L Sandvik/ Swagelok tubing, SS 316 Swagelok fitting - Filter regulator to have 2" 316 SS gauge for pneumatic supply to positioner & actuator					

ITEM	REV	DESC			
			Tag Nos	PV 61301; PV 61401	
45	C	ACTUATOR	Manufacturer	Weir ISK	
46	C		Model Number	A61ADB4MC	
47			Type / Style	Pneumatic	Diaphragm
48	C		Size / Spring Rating	50 sq.in.	0.4 - 2.1 barg
49			Supply Fail Action	Valve Closes	
50			Valve Travel/Stem Thread	25 mm	M8x1
51			Handwheel	None	
52			Limit Stop	None	
53	C		Air Supply / Min Air Reqd.	5.2 barg	2.4 barg
54	C		Open / Close Time	< 15 s	< 15 s
55			Pneu. Conn. / Inst. Pipe	1/4" NPT	Stainless Steel
56	B		Instrument Fittings	Swagelok (Imperial)	
57	B	POSITIONER	Positioner Make / Model	Fisher	DVC 6010s
58			Communications	HART	
59	D		Input Signal/Action	4-20 mA	Single
60			Transmitter / Limit Switch	No	No
61			Electrical Connection	M20 x 1.5mm	
62			Gauges	2	
63	B		Part Number	DVC6010	
64	D	OTHER INST./ACCESSORIES	Airset Make / Model	Fisher	67CFSR
65	D		Airset Filter / Gauges	5 microns	Yes
66	D		Limit Switch Make / Model		
67	D		Limit Switch Position		
68	D		Vol. Tank Make / Model		
69	D		I/P Conv. Make / Model		
70	D		Vol. Booster Make/Model		
71	D		Airlock Make / Model		
72	D		Sol. Valve Make / Model		
73	D		Solenoid Part Number		
74	D		Solenoid Action		
75					
76					
77					
78		SPECIAL REQ.	PED Classification	n/a	
79	D		ATEX Reference	Gr II Cat 2 T6	
80	C		Hazardous Area Class	Zone 1	
81			IP Code	65	
82	D		Electrical Certification	Eex d	
83			Machinery Directive	n/a	
84			NDE	Rad	
85	C		Acceptance Standards	ASME B16.34	
86	C	PAINT	Valve Body / Bonnet	ZAWTIKA S01, RAL 9010	
87	C		Actuator	ZAWTIKA S01, RAL 9010	
88	C		Actuator / Valve Mounting	ZAWTIKA S01, RAL 9010	
90		OTHER DETAILS			

Inspection and Test

Test		Checked By B.C.V.	Configurator Customer	3rd Party
Hydrostatic Test	78barg	X		
Seat Leakage Pressure	Water @ 60 lbf/in² (4 bar)			
Allowable Seat Leakage	16.1 cc/min	X		
Functional Test		X		
Special Tests				

Engineering Approved | Date | Design Assurance Group | Quality Plan

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Revision Control

Rev	Rev Date	Rev By
D	16/10/2012	long
C	19/07/2012	long
B	22/02/2012	long
A	31/01/2012	long
0	17/10/2011	long

WEIR CONTROL & CHOKE VALVES — Technical Specification Sheet

Customer	PROCESS GROUP	WVC Order No.	
Customer Ref.	4963	Line No.	8"-OW-61033-CS1N
Customer Item No.	FV-61310	Quotation No	30033346/0010
Customer Enquiry/Order No.	CONTROL VALVES	Quantity	1
Project Title	ZAWTIKA - PRODUCED WATER PACKAGE	Sales Engineer	Weir Valves & Controls UK Ltd
Application	Standard	Valve Code	100-500-300-A102A-MF-RARAKD6RB

ITEM	REV	DESC						
			Program Version	5.8.0				
			Service Medium: Water		Phase: Liquid			
1	A	PROCESS DATA	**Condition**		1	2	3	
2	C		Liquid Flow Rate	m³/h	141.36	141.36	26.5	
3	C		Inlet Pressure	barg	8.9	12.6	**12.6**	
4	A		Outlet Pressure	barg	1.8	1.8	1.8	
5	C		Pressure Drop	bar	7.1	10.8	**10.8**	
6	A		Inlet Temperature	℃	20	40	40	
7	A		Specific Gravity		1.012	0.997	**0.997**	
8	C		Vapour Pressure	bar(a)	0.023	0.074	0.023	
9	A		Critical Pressure	bar(a)	221.3	221.3	221.3	
10	A		Viscosity	Centi-Poise	1.002	0.651	0.651	
11								
12	D		Calc Cv	US Units	61.9	49.8	**9.34**	
13	C		SPL @ 1m	dBA	<60	<75	<60	
14	C		Valve Travel	%	77	62	**12**	
15	C		Inlet Velocity	m/sec	4.85	4.85	**0.909**	
16	C		Outlet Velocity	m/sec	4.85	4.85	**0.909**	
17		DESIGN	Design: Press / Temp		40barg		-29℃ / 75℃	
18	B		Shut-Off Pressure		40bar			
19	D		Inlet Pipe Size / Schedule		200 mm (8")		Shd 60	
20	D		Outlet Pipe Size / Schedule		200 mm (8")		Shd 60	
21			Pipe Insulation Thickness		None			
22		BODY/BONNET ASSEMBLY	Valve Range / Model		BV 500			
23			Body Type/Style		Globe			
24	C		Nominal Valve Size		100 mm (4")			
25			Body Rating		ASME 300			
26	D		Inlet Size / Connection		100 mm (4")		Flanged R/F	
27	D		Outlet Size / Connection		100 mm (4")		Flanged R/F	
28			Body Material		ASTM A216 WCB			
29			Bonnet Style		Standard			
30			Bonnet Material		ASTM A216 WCB			
31	C		Body / Bonnet Bolting		B7/2H hot dip galvanized to ASTM A153			
32			Gasket Material		316 L ST.ST. / GRAPHITE			
33	C		Gland Packing Type		PTFE Chevrons			
34			Ind. Spec: Wetted Parts		NACE			
35	C	TRIM DESIGN	Trim Type / Trim Size		Multi-Flow			
36	D		Valve Design Cv		80			
37	B		Flow Direction / Characteristic		Over		Linear	
38	D		Plug Design / Plug Seal Ring		Balanced		Carb/PTFE U Seal	
39	C		Plug Material		316L ST.ST. + Tungsten Carbide			
40	C		Guide Material		316L ST.ST. + Tungsten Carbide			
41	C		Seat Material		316L ST.ST. + Tungsten Carbide			
42			Leakage Class		IEC 60534-4 Class IV			
43			Stem Diameter / Material		16 mm		316L ST.ST.	
44			Silencer					
89	D	OTHER DETAILS	- 316SS tag plate & name plate required - Bolts/Nuts: B7/2H hot dip galvanized to ASTM A-153 - Valve body & actuator to be painted per S01 of ZGS-COR-301 - RF B16.5, smooth finish with roughness between 250-500µ-inch - 3/8" SS 904L Sandvik/ Swagelok tubing, SS 316 Swagelok fitting - Filter regulator to have 2" 316 SS gauge for pneumatic supply to positioner & actuator					

ITEM	REV	DESC			
			Tag Nos	FV 61310	
45	C	ACTUATOR	Manufacturer	Weir BDK	
46	C		Model Number	RARAKD6RB	
47			Type / Style	Pneumatic	Diaphragm
48	B		Size / Spring Rating	200 sq.in.	0.5 - 2.2 barg
49			Supply Fail Action	Valve Closes	
50	A		Valve Travel/Stem Thread	38 mm	M16x1.5
51			Handwheel	None	
52			Limit Stop	None	
53	C		Air Supply / Min Air Reqd.	4.5 barg	2.3 barg
54	C		Open / Close Time	< 15 s	< 15 s
55			Pneu. Conn. / Inst. Pipe	1/4" NPT	Stainless Steel
56	B		Instrument Fittings	Swagelok (Imperial)	
57	B	POSITIONER	Positioner Make / Model	Fisher	DVC 6010s
58			Communications	HART	
59	D		Input Signal/Action	4-20 mA	Single
60			Transmitter / Limit Switch	No	No
61			Electrical Connection	M20 x 1.5mm	
62			Gauges	2	
63	B		Part Number	DVC6010	
64	D	OTHER INST./ACCESSORIES	Airset Make / Model	Fisher	67CFSR
65	D		Airset Filter / Gauges	5 microns	Yes
66	D		Limit Switch Make / Model		
67	D		Limit Switch Position		
68	D		Vol. Tank Make / Model		
69	D		I/P Conv. Make / Model		
70	C		Vol. Booster Make/Model	WVC	YT305
71	D		Airlock Make / Model		
72	D		Sol. Valve Make / Model		
73	D		Solenoid Part Number		
74	D		Solenoid Action		
75					
76					
77					
78		SPECIAL REQ.	PED Classification	n/a	
79	D		ATEX Reference	Gr II Cat 2 T6	
80	C		Hazardous Area Class	Zone 1	
81			IP Code	65	
82	D		Electrical Certification	Eex d	
83			Machinery Directive	n/a	
84			NDE	Rad	
85	C		Acceptance Standards	ASME B16.34	
86	C	PAINT	Valve Body / Bonnet	ZAWTIKA S01, RAL 9010	
87	C		Actuator	ZAWTIKA S01, RAL 9010	
88	C		Actuator / Valve Mounting	ZAWTIKA S01, RAL 9010	
90		OTHER DETAILS			

Inspection and Test

Test		Checked By B.C.V.	Configurator Customer	3rd Party
Hydrostatic Test	78barg	X		
Seat Leakage Pressure	Water @ 60 lbf/in² (4 bar)			
Allowable Seat Leakage	229.9 cc/min	X		
Functional Test		X		
Special Tests				

Engineering Approved | Date | Design Assurance Group | Quality Plan

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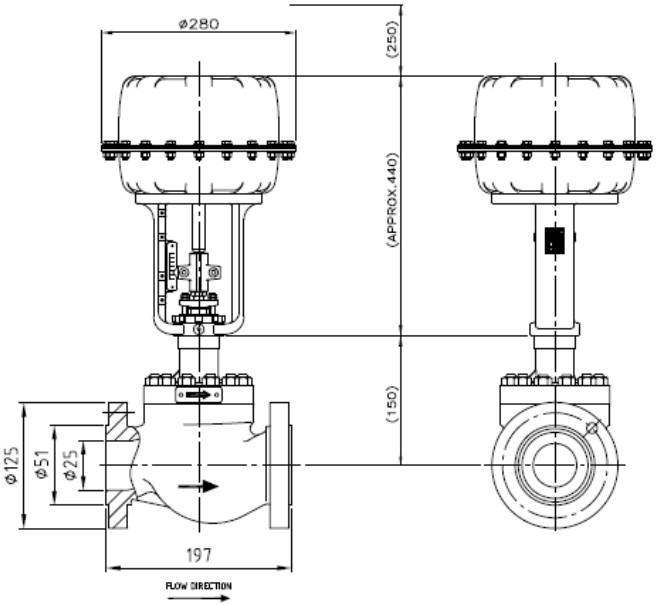
Revision Control

Rev	Rev Date	Rev By
D	16/10/2012	long
C	19/07/2012	long
B	22/02/2012	long
A	30/01/2012	long
0	17/10/2011	long

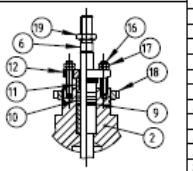
W-BV502-DN25-01



PART LIST

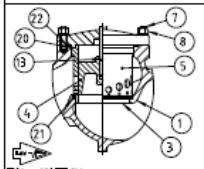
REF	NAME OF PARTS	MATERIAL	RE.
1	BODY	ASTM A216-WCB	
2	BONNET	ASTM A216-WCB(STANDARD)	
3	VALVE SEAT	A276-316 ST.ST + STE.FACE	
4	VALVE PLUG	A276-316 ST.ST + STE.FACE	
5	VALVE CAGE	A564-630 ST.ST	
6	STEM	A276-316 ST.ST	
7	BODY STUD	A193-B7(HOT DIP GALVANIZED TO ASTM A153)	
8	BODY NUT	A194-2H(HOT DIP GALVANIZED TO ASTM A153)	
9	SUPPORT RING	A276-316	
10	PACKING RINGS SET	TEF/CHEV(DOUBLE OPPOSED)	
11	PACKING FOLLOWER	A276-316	
12	PACKING FLANGE	A276-316	
13	PLUG STEM PIN	A276-316	
14	PLUG SEAL RING	NONE	
16	PACKING STUD BOLT	A193-B7(HOT DIP GALVANIZED TO ASTM A153)	
17	PACKING STUD NUT	A194-2H(HOT DIP GALVANIZED TO ASTM A153)	
18	GLAND FLANGE	A276-316	
19	COUPLING LOCKNUT	A276-304	
20	BONNET GASKET	316 STAINLESS STEEL & GRAPHITE	
21	SEAT GASKET	316 STAINLESS STEEL & GRAPHITE	
22	UPPER GASKET	316 STAINLESS STEEL & GRAPHITE	
23	POSITIONER		
24	FILTER & REGULATOR		

PACKING PARTS



PACKING : TEFLON CHEVLON

TRIM PARTS

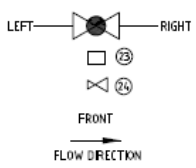


TRIM : MULTIFLOW SOLID

MODEL	BV502	LIMIT SWITCH	NONE
BODY SIZE	25mm(1") ASME 300#/RF	SOLENOID V/V	NONE
ACTUATOR	Pneumatic Disp. 50 SQ.IN./R.A	LOCKUP V/V	NONE
TRIM	EQ% MULTI-FLOW	BOOSTER	NONE
HANDWHEEL	NONE	TRIP V/V	NONE
POSITIONER	FISHER DVC 6010S	TRANSMITTER	NONE
FILTER REG.	FISHER 67CFSR	VOLUME TANK	NONE

- VALVE WEIGHT: 60 Kg
- Quantity: 2 Sets.

HANDWHEEL & ACCESSORIES LOCATION



FOR APPROVAL

NOTES :
- AIR CONNECTION/ MATERIAL : 1/4" NPT(F)/ 316SS
- ELECTRIC CABLE CONDUIT CONNECTION : M20x1.5mm
- TUBE AND FITTING MATERIAL : 316SS SWAGELOK
- IND.SPEC : NACE

Rev.	Date	DESCRIPTION	PREPD	CHKD	APPD
3	07.MAR.13	FOR APPROVAL	SA KIM	JS NA	BS KIM

Owner : WPI SINGAPORE

Sub-Supplier : WEIR

Project : 8001049

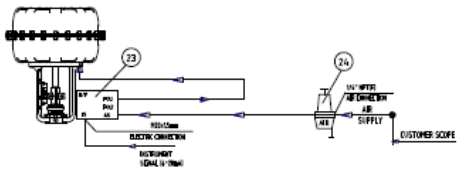
Prepared By	Date
SA KIM	07.MAR.13
Checked By	Date
JS NA	07.MAR.13
Approved By	Date
BS KIM	07.MAR.13
Job No.	

PV-61301 / PV-61401

Drawing No.	Page-No.	Rev.
W-BV502-DN25-01	01 of 03	A

PNEUMATIC DIAGRAM

23. POSITIONER
24. FILTER REGULATOR



AIR FAIL POSITION : CLOSE

FLANGE DATA

INLET 1" x OUTLET 1"

HOLES	4
DRILLED	19
P.C.D	88.9
THICKNESS	17.9

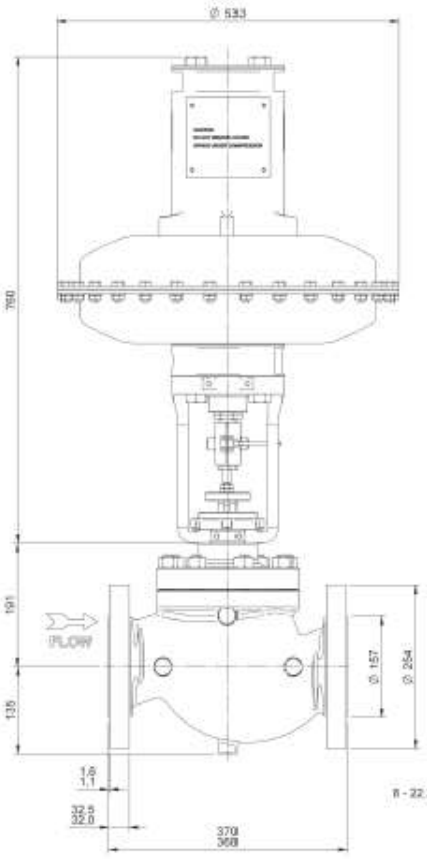
ANSI, ASME B16.5

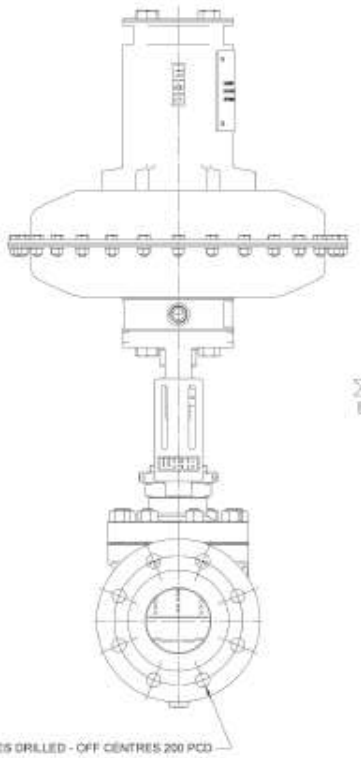
* SERIAL NO. : 13667, 13669

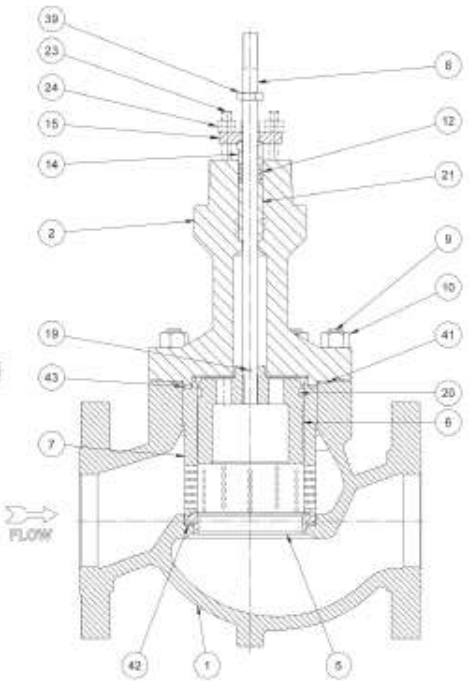
DO NOT SCALE | FIRST ANGLE PROJECTION | 44301562-0010 | A

ALLOW 200mm FOR REMOVAL OF ACTUATOR

IF IN DOUBT ASK



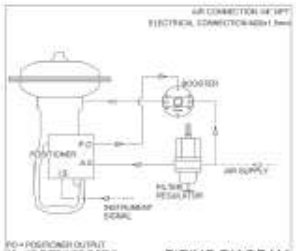




REF	PART DESCRIPTION	
1	BODY	
2	BONNET	
5	SEAT RING	*
6	VALVE PLUG	*
7	VALVE CAGE	*
8	PLUG STEM	*
9	BODY STUD	
10	BODY NUT	
12	PACKING RINGS / SET	*
14	PACKING FOLLOWER	
15	PACKING FLANGE	
19	PLUG STEM PIN	*
20	PLUG SEAL RING	*
21	PACKING BUSH	*
23	PACKING STUD	
24	PACKING NUT	
39	COUPLING LOCKNUT	
41	BONNET GASKET	*
42	SEAT GASKET	*
43	CAGE GASKET	*

* RECOMMENDED SPARES FOR VALVE

U SEAL ORIENTATION



PIPING DIAGRAM

DESCRIPTION	100mm BV500 SERIES MULTIFLOW TRIM - LINEAR CHARACTERISTIC ANSI 300 RF FLANGED END CONNECTIONS STANDARD BONNET PTFE CHEVRON PACKING BODY MATERIAL - ASTM A216 WCB RARAKDSRD DIAPHRAGM ACTUATOR ON AIR FAILURE - VALVE CLOSES AIR FILTER REGULATOR - FISHER 67CFSR POSITIONER - FISHER DVC 6010i VOL. BOOSTER - WVC YT395
CUSTOMER	WEIR POWER & INDUSTRIAL SINGAPORE
CUSTOMER ORDER No	6001101
TAG Nos	FV 61310
PROJECT	-
QUANTITY	1
WVCUK ORDER No	44301562
WVCUK ITEM No	10

VALVE WEIGHT = 67Kg
ACTUATOR WEIGHT = 77Kg
TOTAL WEIGHT = 144Kg

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ISSUE	ALTERATION	DATE	BY	CHECKED
A	ORIGINAL ISSUE			

GENERAL NOTES - UNLESS OTHERWISE STATED
1. DIMENSIONS MM.

WEIR VALVES & CONTROLS | BAILEY VALVE | HOPKINSONS | MACValves

DRAWN	DC	DATE	17/04/13
CHECKED	AP		

TITLE: GENERAL ARRANGEMENT

44301562-0010 | A

PCV-61301

FCV-61310