Control Valve Calculation Sheet

Item No.	1		Ref No.		
Tag No.	LV-028		Purchaser		
Service			End User	SIBUR2	
			Project / Unit		

Valve specification	Model	HLS		Pipe spec.		
	Nominal size	1/2 inch		Unit	Upstream	Downstream
	Port size	Cv=1.6 inch	Size	inch	2	2
	Rating	ANSI600	Sch No.		40	40
	Flow characteristic	EQ%	Thickness	mm	3.9	3.9

Process data	Condition	1			
	Fluid name	Hydrocarbons with Water			LIQUID
		Unit	MAX	NOR	MIN
	Flow rate	kg/h	1378	1148	918
	Inlet pressure	kgf/cm2G	53	53	53
	Outlet pressure	kgf/cm2G	14	14	14
	Differential pressure	kgf/cm2	39	39	39
	Temperture	degC	40	40	40
	Gravity/Density(Liquid)	kg/m3	1005	1005	1005
	Gravity/Density(Gas or Vaper	MW			
	Viscosity	cSt	0.74	0.74	0.74
	Vaper pressure	kPaA			
	Critical pressure	kPaA			
	Specific heat ratio				
	Compression facter				
	Flash				

Calculated value	Calculated CV		0.2573	0.2143	0.1713
	Rated CV			1.6	
	Travel	%	50	45	39
	Sound pressure level	dBA	60	59	59
	Inlet velocity	m/s	3.105	2.587	2.069

Factors	Saturated temperature	degC			
	Reynols number factor		1	1	1
	Differential pressure ratio		0.7218	0.7218	0.7218
	Calculation formura		**No. 1**	**No. 2**	**No. 3**

No.1

$$CV(liq) = \frac{1.371 m^3/h \times \mathrm{Sqr}(1.005)}{0.0865 \times 0.9985 \times \mathrm{Sqr}(3825 kPa)} = 0.2573$$

No.2

$$CV(liq) = \frac{1.142 m^3/h \times \mathrm{Sqr}(1.005)}{0.0865 \times 0.9989 \times \mathrm{Sqr}(3825 kPa)} = 0.2143$$

No.3

$$CV(liq) = \frac{0.9134 m^3/h \times \mathrm{Sqr}(1.005)}{0.0865 \times 0.9993 \times \mathrm{Sqr}(3825 kPa)} = 0.1713$$

Control Valve Calculation Sheet

Item No.	2	Ref No.	
Tag No.	LV-013	Purchaser	
Service		End User	SIBUR2
		Project / Unit	

Valve specification	Model	AGVB		Pipe spec.		
	Nominal size	2	inch		Unit	Upstream	Downstream
	Port size	2	inch	Size	inch	2	2
	Rating	ANSI150		Sch No.		40	40
	Flow characteristic	EQ%		Thickness	mm	3.9	3.9

Process data	Condition	1	Condensate on Output		
	Fluid name	Hydrocarbons with Water			LIQUID
		Unit	MAX	NOR	MIN
	Flow rate	kg/h	879	733	586
	Inlet pressure	kgf/cm2G	13.79	13.79	13.79
	Outlet pressure	kgf/cm2G	0.3	0.3	0.3
	Differential pressure	kgf/cm2	13.49	13.49	13.49
	Temperture	degC	25	25	25
	Gravity/Density(Liquid)	kg/m3	654	654	654
	Gravity/Density(Gas or Vaper	MW			
	Viscosity	cSt	0.74	0.74	0.74
	Vaper pressure	kPaA			
	Critical pressure	kPaA			
	Specific heat ratio				
	Compression facter				
	Flash				

Calculated value	Calculated CV		0.3455	0.2881	0.2303
	Rated CV		50		
	Travel	%			
	Sound pressure level	dBA	54	53	52
	Inlet velocity	m/s	0.1902	0.1586	0.1268

Factors	Saturated temperature	degC			
	Reynols number factor		1	1	1
	Differential pressure ratio		0.9101	0.9101	0.9101
	Calculation formura		**No. 1**	**No. 2**	**No. 3**

No.1

$$CV(liq) = \frac{1.344m3/h \times Sqr(0.654)}{0.0865 \times Sqr(1323kPa)} = 0.3455$$

No.2

$$CV(liq) = \frac{1.121m3/h \times Sqr(0.654)}{0.0865 \times Sqr(1323kPa)} = 0.2881$$

No.3

$$CV(liq) = \frac{0.896m3/h \times Sqr(0.654)}{0.0865 \times Sqr(1323kPa)} = 0.2303$$

Control Valve Calculation Sheet

Item No.	2		Ref No.		
Tag No.	LV-013		Purchaser		
Service			End User	SIBUR2	
			Project / Unit		

Valve specification	Model	AGVB		Pipe spec.		
	Nominal size	2 inch		Unit	Upstream	Downstream
	Port size	2 inch	Size	inch	2	2
	Rating	ANSI150	Sch No.		40	40
	Flow characteristic	EQ%	Thickness	mm	3.9	3.9

Process data	Condition	2	Water on Output		
	Fluid name				LIQUID
		Unit	MAX	NOR	MIN
	Flow rate	kg/h	5016	4180	3344
	Inlet pressure	kPaG	13.79	13.79	13.79
	Outlet pressure	kPaG	0.3	0.3	0.3
	Differential pressure	kPa	13.49	13.49	13.49
	Temperture	degC	25	25	25
	Gravity/Density(Liquid)	kg/m3	1008	1008	1008
	Gravity/Density(Gas or Vaper	MW			
	Viscosity	mPa-s	0.84	0.84	0.84
	Vaper pressure	kPaA			
	Critical pressure	kPaA			
	Specific heat ratio				
	Compression facter				
	Flash				

Calculated value	Calculated CV		15.73	13.1	10.48
	Rated CV			50	
	Travel	%	64	60	55
	Sound pressure level	dBA	50	50	50
	Inlet velocity	m/s	0.7043	0.587	0.4696

Factors	Saturated temperature	degC			
	Reynols number factor		1	1	1
	Differential pressure ratio		0.1172	0.1172	0.1172
	Calculation formura		**No. 1**	**No. 2**	**No. 3**

No.1

$$CV(liq) = \frac{4.976 m^3/h \times \sqrt{1.008}}{0.0865 \times \sqrt{13.49 kPa}} = 15.73$$

No.2

$$CV(liq) = \frac{4.147 m^3/h \times \sqrt{1.008}}{0.0865 \times \sqrt{13.49 kPa}} = 13.1$$

No.3

$$CV(liq) = \frac{3.317 m^3/h \times \sqrt{1.008}}{0.0865 \times \sqrt{13.49 kPa}} = 10.48$$

Control Valve Calculation Sheet

Item No.	2	Ref No.	
Tag No.	LV-013	Purchaser	
Service		End User	SIBUR2
		Project / Unit	

Valve specification	Model	AGVB		Pipe spec.		
	Nominal size	2 inch		Unit	Upstream	Downstream
	Port size	2 inch	Size	inch	2	2
	Rating	ANSI150	Sch No.		40	40
	Flow characteristic	EQ%	Thickness	mm	3.9	3.9

Process data	Condition	3	Gas on Output		
	Fluid name				GAS
		Unit	MAX	NOR	MIN
	Flow rate	kg/h	326	272	217
	Inlet pressure	kPaG	13.79	13.79	13.79
	Outlet pressure	kPaG	0.3	0.3	0.3
	Differential pressure	kPa	13.49	13.49	13.49
	Temperture	degC	25	25	25
	Gravity/Density(Liquid)	kg/m3			
	Gravity/Density(Gas or Vaper	kg/m3[A]	2.7	2.7	2.7
	Viscosity	mPa-s			
	Vaper pressure	kPaA			
	Critical pressure	kPaA			
	Specific heat ratio				
	Compression facter				
	Flash				

Calculated value	Calculated CV		20.86	17.4	13.87
	Rated CV			50	
	Travel	%	70	66	61
	Sound pressure level	dBA	54	53	51
	Outlet velocity	Mach	0.07924	0.06611	0.05275

Factors	Saturated temperature	degC			
	Reynols number factor		1	1	1
	Differential pressure ratio		0.1172	0.1172	0.1172
	Calculation formura		**No. 1**	**No. 2**	**No. 3**

No.1

$$CV(\text{gas or vap.}) = \frac{132.8\text{m3/h[S]} \times \text{Sqr}(58.14 \times 298.2\text{degK} \times 1)}{22.5 \times 115.1\text{kPa} \times 0.9455 \times \text{Sqr}(0.1172)} = 20.86$$

No.2

$$CV(\text{gas or vap.}) = \frac{110.8\text{m3/h[S]} \times \text{Sqr}(58.14 \times 298.2\text{degK} \times 1)}{22.5 \times 115.1\text{kPa} \times 0.9459 \times \text{Sqr}(0.1172)} = 17.4$$

No.3

$$CV(\text{gas or vap.}) = \frac{88.42\text{m3/h[S]} \times \text{Sqr}(58.14 \times 298.2\text{degK} \times 1)}{22.5 \times 115.1\text{kPa} \times 0.9465 \times \text{Sqr}(0.1172)} = 13.87$$

Control Valve Calculation Sheet

Item No.	2		Ref No.		
Tag No.	LV-013		Purchaser		
Service			End User	SIBUR2	
			Project / Unit		

Valve specification	Model	AGVB	Pipe spec.			
	Nominal size	2 inch		Unit	Upstream	Downstream
	Port size	2 inch	Size	inch	2	2
	Rating	ANSI150	Sch No.		40	40
	Flow characteristic	EQ%	Thickness	mm	3.9	3.9

Process data	Condition	4	Liquid of Inlet		
	Fluid name				LIQUID
		Unit	MAX	NOR	MIN
	Flow rate	kg/h	6220	5184	4147
	Inlet pressure	kPaG	13.79	13.79	13.79
	Outlet pressure	kPaG	0.3	0.3	0.3
	Differential pressure	kPa	13.49	13.49	13.49
	Temperture	degC	40	40	40
	Gravity/Density(Liquid)	kg/m3	894	894	894
	Gravity/Density(Gas or Vaper	kg/m3[A]			
	Viscosity	mPa-s			
	Vaper pressure	kPaA			
	Critical pressure	kPaA			
	Specific heat ratio				
	Compression facter				
	Flash				

Calculated value	Calculated CV		20.71	17.26	13.81
	Rated CV			50	
	Travel	%	69	66	61
	Sound pressure level	dBA	50	50	50
	Inlet velocity	m/s	0.9848	0.8208	0.6566

Factors	Saturated temperature	degC			
	Reynols number factor		1	1	1
	Differential pressure ratio		0.1172	0.1172	0.1172
	Calculation formura		**No. 1**	**No. 2**	**No. 3**

No.1

$$CV(liq) = \frac{6.957 m^3/h \times \sqrt{0.894}}{0.0865 \times \sqrt{13.49 kPa}} = 20.71$$

No.2

$$CV(liq) = \frac{5.799 m^3/h \times \sqrt{0.894}}{0.0865 \times \sqrt{13.49 kPa}} = 17.26$$

No.3

$$CV(liq) = \frac{4.639 m^3/h \times \sqrt{0.894}}{0.0865 \times \sqrt{13.49 kPa}} = 13.81$$