HYUNDAI ENGINEERING CO., LTD.

TECHNICAL BID EVALUATION TABULATION

REV. NO.: 03

PROJECT : Visotsk Methanol Project

EQUIP'T : Horizontal Centrifugal Pump (ASME/ISO)

NO	DESCRIPTION		UNIT	SPECIFICATION	DONGYANG CHEMICAL PUMP	REMARKS
1	**GENERAL**					
1.1	Proposal No.			G5MP-MR-255-0002	→	
1.2	Item No.			31-P-002 A/B	→	
1.3	Model No.			By Vendor	DAP 10 X 8 - 19	
1.4	No. of Required	(Operation / Stand-by)	Set	(1/1)	→	
1.5	Duty	(Continuous/Intermittent)		Continuous	→	
1.6	Country of Origin			By Vendor	Korea	
1.7	Transport			FOB	→	
1.8	Delivery duration			By Vendor	7months after P.O Issued	
2	**SITE / LOCATION CONDITION**					
2.1	Installation	(Indoor/Shelter/Outdoor)		Shelter	→	
2.2	Weather Protection Required			Required	→	
2.3	Hazardous Area Classification			Non-hazardous	→	
2.4	Ambient Temperature			-37~40℃	→	
3	**DESIGN CONDITION**					
3.1	Liquid Properties					
	1) Name of Liquid			Desalinated Water	→	
	2) Pumping Temp.	Min. / Rated / Max.	℃	AMB	→	
	3) Specific Gravity	Min. / Rated / Max.		0.997	→	
	4) Vapour Pressure	Min. / Rated / Max.	bara	0.03	→	
	5) Viscosity	Min. / Rated / Max.	cP	0.89	→	
3.2	Operating Condition					
	1) Capacity	Rated	m3/hr	710	→	
	2) Suction Pressure	Rated	bara	1.02	→	
	3) Discharge Pressure	Rated	bara	6.65	→	
	4) Differential Pressure @ Discharge Nozzle		bar	5.63	→	
	5) Differential Head @ Rated Flow		m	57.5	→	
	6) NPSHa @ Rated Flow		m	10.1	→	
3.3	General Performance					
	1) Capacity @ Rated Dia. Impeller					
	Min. Continuous Flow (MCF)		m3/hr	By Vendor	310	
	BEP		m3/hr	By Vendor	860	
	Max. Allowable Flow (MAF)		m3/hr	By Vendor	1036	
	2) Head					
	Shut Off Head @ Rated Impeller		m	By Vendor	63.4	
	3) Impeller Diameter			By Vendor		

4	**EQUIPMENT SPECIFICATION**						
4.1	Applicable Code and Standard				ASME/ISO	→	
4.2	Pump Type				OH1	→	
4.3	Pressure Casing Connections						
	1) Suction	(Size/Rating/Facing/Position)			By Vendor	10"/ASME #150 / R.F / END	
	2) Discharge	(Size/Rating/Facing/Position)			By Vendor	8"/ASME #150 / R.F / TOP	
	4) Casing Drain	(Size / Rating)			By Vendor	1/2" / ASME #150	
4.4	Casing						
	1) Mounting				By Vendor	FOOT	
	2) Split	(Axial / Radial)			By Vendor	RADIAL	
	4) MAWP @ Max. Allowable Temperature			barg	By Vendor	15.9	
	5) Hydrotest Pressure			barg	By Vendor	23.85	
	6) Design Temperature		(Max/Min)	℃	(75/-39)	→	
4.5	Materials						
	1) Casing				SS316L	A351 Gr. CF3M	
	2) Impeller				SS316L	A743 Gr. CF3M	
	3) Shaft				By Vendor	A479 Type 304	
4.6	Mechanical Seal & Its Piping Plan						
	1) Manufacturer				By Vendor	KSM OR EQ.	
	2) Seal Plan				11/61	→	
4.7	Noise Level of Pump + Driver			dB	85	→	
5	**ELECTRICAL**						
5.1	Motor Manufacturer				By Vendor	→	
5.2	Volts / Phase / Hz						
	Motor : 5.5 kW to 250 kW (Induction)			V / Ph / Hz	690V, 3Ph+PE, 50 Hz	→	
5.3	Motor Power			kW	By Vendor	185	
5.4	Motor Speed			rpm	By Vendor	1450	
5.5	Enclosure (Degree of Protection)						
	Motor				IP55	→	
	Terminal box (Indoor / outdoor)				IP55	→	
5.6	Explosion Protection Rating				N/A	→	
5.7	Cooling Method		(TEFC / TEAAC / ETC)		TEFC	TEFC	
5.8	Insulation Material Class				F	→	
5.9	Temperature Rise Class				B	→	
5.10	Staring Method / Current						
	LV Motor				DOL / Max 7 times F.LC	→	
5.11	Bearing Type		(DE / NDE)		By Vendor	BALL	
5.12	Rotation		(Viewed from coupling end)		By Vendor	CW	
5.13	Lubrication		(Grease / Oil)		By Vendor	GREASE	

	A	B	C	D	E	F	G	H	I
1	tag no.	s.g.	capa	head	NPSHa	seal plan	air cooled	pump type	
2	32-P-001 A	0.972	28.7+min.	94.9	8.6	23/61		OH1	
3	32-P-002 A	0.993	50	60	8.63	11/61		OH1	
4	32-P-003 A	0.988	203	60	8.092	11/61		OH1	
5	32-P-004 A	0.993	316	57	8.626	11/61		OH1	
6	32-P-005 A	0.935	114	87.46689	30.8	23/61		OH1	
7	34-P-002 A	0.997	140+Min.	37.2	10	32/61		OH1	
8	31-P-002 A	0.997	710	57.5	10.1	11/61		OH1	
9	31-P-003 A	0.997	134	67.1	9.75	11/61		OH1	
10	31-P-004 A	0.997	20	78	10.1	11/61		OH1	
11	31-P-005 A	0.997	18	78	10.1	11/61		OH1	
12	31-P-006 A	0.997	85	58	10.1	11/61		OH1	
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									

Dr.Pump

<적용대상>

1. Code : API 610
2. Type : OH2, OH6, BB1, BB2, BB3, BB5 (※ Vertical Pump 제외)
3. Driver : Motor (※ Steam Turbine 제외)

<사용방법>

1. 아래 <입력창>에 적절한 값을 입력 (직접 입력하거나 엑셀에서 복사 후 붙여넣기 가능)

- 필수 입력 : Tag No, S.G, Capacity, Head, NPSHa, Frequency(Hz)
- 옵션 사항 : Seal Plan, Air Cooled, Pump Type

2. "계산수행" 버튼 클릭 후 "계산완료" 메세지 출력까지 대기 (약 3분 소요)
3. 예측값 : 펌프 타입, 펌프 효율, Motor Rating, Skid Weight / Length / Width

문의사항이 있으시면 언제든지 연락 바랍니다.

엔지니어링센터 플랜트회전기계설계팀 김형 과장 hkim@hec.co.kr

<입력창>

Frequency (Hz) 50

	Tag No.	S.G.	Capa (m3/hr)	Head (m)	NPSHa (m)	Seal Plan	Air Cooled	Pump Type
1	32-P-001A/B	0.972	28.7	94.9	8.6	23/61		OH1
2	32-P-002A/B	0.993	50	60	8.63	11/61		OH1
3	32-P-003A/B	0.988	203	60	8.092	11/61		OH1
4	32-P-004A/B	0.993	316	57	8.626	11/61		OH1
5	32-P-005A/B	0.935	114	87.46689	30.8	23/61		OH1
6	34-P-002A/B	0.997	140	37.2	10	32/61		OH1
7	31-P-002A/B	0.997	710	57.5	10.1	11/61		OH1
8	31-P-003A/B	0.997	134	67.1	9.75	11/61		OH1
9	31-P-004A/B	0.997	20	78	10.1	11/61		OH1
10	31-P-005A/B	0.997	18	78	10.1	11/61		OH1
11	31-P-006A/B	0.997	85	58	10.1	11/61		OH1

초기화 계산수행

<상태창>

Dr.Pump

<적용대상>

1. Code : API 610
2. Type : OH2, OH6, BB1, BB2, BB3, BB5 (※ Vertical Pump 제외)
3. Driver : Motor (※ Steam Turbine 제외)

<사용방법>

1. 아래 <입력창>에 적절한 값을 입력 (직접 입력하거나 엑셀에서 복사 후 붙여넣기 가능)

- 필수 입력 : Tag No, S.G, Capacity, Head, NPSHa, Frequency(Hz)
- 옵션 사항 : Seal Plan, Air Cooled, Pump Type

2. "계산수행" 버튼 클릭 후 "계산완료" 메세지 출력까지 대기 (약 3분 소요)
3. 예측값 : 펌프 타입, 펌프 효율, Motor Rating, Skid Weight / Length / Width

문의사항이 있으시면 언제든지 연락 바랍니다.

엔지니어링센터 플랜트회전기계설계팀 김형 과장 hkim@hec.co.kr

<입력창>

Frequency (Hz) 50

	Tag No.	S.G.	Capa (m3/hr)	Head (m)	NPSHa (m)	Seal Plan	Air Cooled	Pump Type
1	32-P-001A/B	0.972	28.7	94.9	8.6	23/61		OH1
2	32-P-002A/B	0.993	50	60	8.63	11/61		OH1
3	32-P-003A/B	0.988	203	60	8.092	11/61		OH1
4	32-P-004A/B	0.993	316	57	8.626	11/61		OH1
5	32-P-005A/B	0.935	114	87.46689	30.8	23/61		OH1
6	34-P-002A/B	0.997	140	37.2	10	32/61		OH1
7	31-P-002A/B	0.997	710	57.5	10.1	11/61		OH1
8	31-P-003A/B	0.997	134	67.1	9.75	11/61		OH1
9	31-P-004A/B	0.997	20	78	10.1	11/61		OH1
10	31-P-005A/B	0.997	18	78	10.1	11/61		OH1
11	31-P-006A/B	0.997	85	58	10.1	11/61		OH1

초기화 계산수행

<상태창>

==========H20 서버 연결 시도 (step:0/21)==========
WARNING:stopit:Could not get the package version from pkg_resources
Checking whether there is an H2O instance running at http://localhost:54321 .

Dr.Pump

<적용대상>

1. Code : API 610
2. Type : OH2, OH6, BB1, BB2, BB3, BB5 (※ Vertical Pump 제외)
3. Driver : Motor (※ Steam Turbine 제외)

<사용방법>

1. 아래 <입력창>에 적절한 값을 입력 (직접 입력하거나 엑셀에서 복사 후 붙여넣기 가능)

- 필수 입력 : Tag No, S.G, Capacity, Head, NPSHa, Frequency(Hz)
- 옵션 사항 : Seal Plan, Air Cooled, Pump Type

2. "계산수행" 버튼 클릭 후 "계산완료" 메세지 출력까지 대기 (약 3분 소요)
3. 예측값 : 펌프 타입, 펌프 효율, Motor Rating, Skid Weight / Length / Width

문의사항이 있으시면 언제든지 연락 바랍니다.

엔지니어링센터 플랜트회전기계설계팀 김형 과장 hkim@hec.co.kr

<입력창>

Frequency (Hz) 50

	Tag No.	S.G.	Capa (m3/hr)	Head (m)	NPSHa (m)	Seal Plan	Air Cooled	Pump Type
1	32-P-001A/B	0.972	28.7	94.9	8.6	23/61		OH1
2	32-P-002A/B	0.993	50	60	8.63	11/61		OH1
3	32-P-003A/B	0.988	203	60	8.092	11/61		OH1
4	32-P-004A/B	0.993	316	57	8.626	11/61		OH1
5	32-P-005A/B	0.935	114	87.46689	30.8	23/61		OH1
6	34-P-002A/B	0.997	140	37.2	10	32/61		OH1
7	31-P-002A/B	0.997	710	57.5	10.1	11/61		OH1
8	31-P-003A/B	0.997	134	67.1	9.75	11/61		OH1
9	31-P-004A/B	0.997	20	78	10.1	11/61		OH1
10	31-P-005A/B	0.997	18	78	10.1	11/61		OH1
11	31-P-006A/B	0.997	85	58	10.1	11/61		OH1

초기화 계산수행

<상태창>

==========eff 예측값 생성 완료 (step:16/21)==========
==========Motor Rating 계산 완료 (step:17/21)==========
========Skid Weight 예측값 생성 완료 (step:18/21)========
========Skid Length 예측값 생성 완료 (step:19/21)========

Dr.Pump

<적용대상>

1. Code : API 610
2. Type : OH2, OH6, BB1, BB2, BB3, BB5 (※ Vertical Pump 제외)
3. Driver : Motor (※ Steam Turbine 제외)

<사용방법>

1. 아래 <입력창>에 적절한 값을 입력 (직접 입력하거나 엑셀에서 복사 후 붙여넣기 가능)

- 필수 입력 : Tag No, S.G, Capacity, Head, NPSHa, Frequency(Hz)
- 옵션 사항 : Seal Plan, Air Cooled, Pump Type

2. "계산수행" 버튼 클릭 후 "계산완료" 메세지 출력까지 대기 (약 3분 소요)
3. 예측값 : 펌프 타입, 펌프 효율, Motor Rating, Skid Weight / Length / Width

문의사항이 있으시면 언제든지 연락 바랍니다.

엔지니어링센터 플랜트회전기계설계팀 김형 과장 hkim@hec.co.kr

<입력창>

Frequency (Hz)

	Tag No.	S.G.	Capa (m3/hr)	Head (m)				mp Type
1	32-P-001A/B	0.972	28.7	94.9				
2	32-P-002A/B	0.993	50	60				
3	32-P-003A/B	0.988	203	60	8.092	11/61		OH1
4	32-P-004A/B	0.993	316	57	8.626	11/61		OH1
5	32-P-005A/B	0.935	114	87.46689	30.8	23/61		OH1
6	34-P-002A/B	0.997	140	37.2	10	32/61		OH1
7	31-P-002A/B	0.997	710	57.5	10.1	11/61		OH1
8	31-P-003A/B	0.997	134	67.1	9.75	11/61		OH1
9	31-P-004A/B	0.997	20	78	10.1	11/61		OH1
10	31-P-005A/B	0.997	18	78	10.1	11/61		OH1
11	31-P-006A/B	0.997	85	58	10.1	11/61		OH1

초기화 | 계산수행

계산완료

계산완료

OK 버튼을 누르시면 결과창으로 이동합니다.

OK

<상태창>

```
========Skid Length 예측값 생성 완료 (step:19/21)========
========Skid Width 예측값 생성 완료 (step:20/21)=========
H2O session _sid_bc98 closed.
==============H2O 서버 종료 (step:21/21)==============
```

Dr.Pump

<결과창>

	Tag No	S.G.	Capa (m3/h)	Head (m)	NPSHa (m)	Seal Plan	Air Cooled	Option	Pump Type	Type_Proba	Efficiency (%)	BHP (kW)	Motor (kW)	Weight (kg)	Length (mm)	Width (mm)
1	32-P-001A/B	0.972	28.7	94.9	8.6	23/61	No	best	OH2	1.0	53	13.6	18.5	900.0	1900.0	1100.0
2	32-P-002A/B	0.993	50.0	60.0	8.63	11/61	No	best	OH2	1.0	53	15.3	22.0	900.0	2100.0	1000.0
3	32-P-003A/B	0.988	203.0	60.0	8.092	11/61	No	best	OH2	1.0	71	46.2	55.0	1500.0	2300.0	1100.0
4	32-P-004A/B	0.993	316.0	57.0	8.626	11/61	No	best	OH2	1.0	76	64.1	75.0	1700.0	2400.0	1100.0
5	32-P-005A/B	0.935	114.0	87.46689	30.8	23/61	No	best	OH2	0.99	62	41.0	55.0	1400.0	2400.0	1200.0
6	34-P-002A/B	0.997	140.0	37.2	10.0	32/61	No	best	OH2	0.99	70	20.2	30.0	900.0	2200.0	1100.0
7	31-P-002A/B	0.997	710.0	57.5	10.1	11/61	No	best	OH2	0.79	76	145.9	185.0	3700.0	3400.0	1700.0
8	31-P-003A/B	0.997	134.0	67.1	9.75	11/61	No	best	OH2	1.0	53	46.1	55.0	1400.0	2300.0	1100.0
9	31-P-004A/B	0.997	20.0	78.0	10.1	11/61	No	best	OH2	1.0	36	11.8	15.0	600.0	2000.0	1000.0

입력창으로 돌아가기

엑셀 출력

<부가설명>

1. 빨간색 셀 : 해당 타입은 과거 실적이 없으므로 초록색 셀의 펌프 타입을 추천
2. 노란색 셀 : 해당 타입은 선정 확률이 낮으므로 초록색 셀의 펌프 타입을 추천
3. 파란색 셀 : 해당 타입은 두 종류 모두 가능하므로 Option 견적 가능

Dr.Pump

<결과창>

	Tag No	S.G.	Capa (m3/h)	Head (m)	NPSHa (m)	Seal Plan	Air Cooled	Option	Pump Type	Type_Proba	Efficiency (%)	BHP (kW)	Motor (kW)	Weight (kg)	Length (mm)	Width (mm)
4	32-P-004A/B	0.993	316.0	57.0	8.626	11/61	No	best	OH2	1.0	76	64.1	75.0	1700.0	2400.0	1100.0
5	32-P-005A/B	0.935	114.0	87.46689	30.8	23/61	No	best	OH2	0.99	62	41.0	55.0	1400.0	2400.0	1200.0
6	34-P-002A/B	0.997	140.0	37.2	10.0	32/61	No	best	OH2	0.99	70	20.2	30.0	900.0	2200.0	1100.0
7	31-P-002A/B	0.997	710.0	57.5	10.1	11/61	No	best	OH2	0.79	76	145.9	185.0	3700.0	3400.0	1700.0
8	31-P-003A/B	0.997	134.0	67.1	9.75	11/61	No	best	OH2	1.0	53	46.1	55.0	1400.0	2300.0	1100.0
9	31-P-004A/B	0.997	20.0	78.0	10.1	11/61	No	best	OH2	1.0	36	11.8	15.0	600.0	2000.0	1000.0
10	31-P-005A/B	0.997	18.0	78.0	10.1	11/61	No	best	OH2	0.77	33	11.6	15.0	600.0	1900.0	900.0
11	31-P-005A/B	0.997	18.0	78.0	10.1	11/61	No	alter	BB12	0.2	31	12.3	18.5	1800.0	2500.0	1400.0
12	31-P-006A/B	0.997	85.0	58.0	10.1	11/61	No	best	OH2	1.0	67	20.0	30.0	1200.0	2100.0	1000.0

입력창으로 돌아가기

엑셀 출력

<부가설명>

1. 빨간색 셀 : 해당 타입은 과거 실적이 없으므로 초록색 셀의 펌프 타입을 추천
2. 노란색 셀 : 해당 타입은 선정 확률이 낮으므로 초록색 셀의 펌프 타입을 추천
3. 파란색 셀 : 해당 타입은 두 종류 모두 가능하므로 Option 견적 가능

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Tag No	S.G.	Capa (m3/	Head (m)	NPSHa (m	Seal Plan	Air Coolec	Option	Pump Typ	Type_Prob	Effic		Motor (kW	Weight (k	Length (m	Width (mm)
2	32-P-001A	0.972	28.7	94.9	8.6	23/61	No	best	OH2	1	53	13.6	18.5	900	1900	1100
3	32-P-002A	0.993	50	60	8.63	11/61	No	best	OH2	1	53	15.3	22	900	2100	1000
4	32-P-003A	0.988	203	60	8.092	11/61	No	best	OH2	1	71	46.2	55	150		100
5	32-P-004A	0.993	316	57	8.626	11/61	No	best	OH2	1	76	64.1	75	1700	2400	1100
6	32-P-005A	0.935	114	87.46689	30.8	23/61	No	best	OH2	0.99	62	41	55	1400	2400	1200
7	34-P-002A	0.997	140	37.2	10	32/61	No	best	OH2	0.99	70	20.2	30	900	2200	1100
8	31-P-002A	0.997	710	57.5	10.1	11/61	No	best	OH2	0.79	76	145.9	185	3700	3400	1700
9	31-P-003A	0.997	134	67.1	9.75	11/61	No	best	OH2	1	53	46.1	55	1400	2300	1100
10	31-P-004A	0.997	20	78	10.1	11/61	No	best	OH2	1	36	11.8	15	600	2000	1000
11	31-P-005A	0.997	18	78	10.1	11/61	No	best	OH2	0.77	33	11.6	15	600	1900	900
12	31-P-005A	0.997	18	78	10.1	11/61	No	alter	BB12	0.2	31	12.3	18.5	1800	2500	1400
13	31-P-006A	0.997	85	58	10.1	11/61	No	best	OH2	1	67	20	30	1200	2100	1000