

PROJECT :			DATE :	
PROJ. NO.:			BY :	S. Rahimi
CLIENT:			REV :	A
UNIT :			DOC NO.:	


**PUMP HYDRAULIC CALCULATION**

General Data	Tag No. :	P- 805 A/B	Note Ref.
No. of Running Pumps in Parallel	no.	1	
Normal Flow Rate	m <sup>3</sup> /hr	142.7	
Liquid Type	----	Rich Amine	SOR CASE
Temperature	°C	63.26	
Liquid Density	kg/m <sup>3</sup>	1040.00	
Liquid Viscosity	cp	2.1200	
Vapour Pressure	bara	2.0000	0
Pump Overdesign Factor	%	10.00	
Pump Turn down Ratio	%	60.00	
Pump Shutoff Pressure Factor	%	25.00	
Pump Efficiency	%	75.00	

Suction Condition			
Source Operating Pressure	bara	2.000	
Source Design Pressure	bara	4.500	
Static Head	m	3.850	1
Maximum Static Head	m	5.800	
Exchanger Pressure Drop	bar	0.000	
Control Valve Pressure Drop	bar	0.000	
Other Losses	bar	0.070	strainer
Metering Loss	bar	0.000	
Acceleration Loss	m	0.000	
Pipe Length	m	61	
Nominal Pipe Size	inch	10	
Pipe Schedule No.	----	80	
Pipe Roughness (DEF.)	inch	0.00180	

Fittings Quantity			
* tee flow thru	no.	0	
* tee branch	no.	0	
* elbow 90 deg LR	no.	0	
* elbow 90 deg screwed	no.	0	
* elbow 45 deg LR	no.	0	
* elbow 45 deg screwed	no.	0	
* close pattern return bend	no.	0	
* gate valve	no.	0	
* ball valve	no.	0	
* globe valve	no.	0	
* angle valve	no.	0	
* butterfly valve (2" - 8")	no.	0	
* butterfly valve (10" - 14")	no.	0	
* butterfly valve (16" - 24")	no.	0	
* check valve swing	no.	0	
* check valve lift	no.	0	
* check valve stop lift	no.	0	
* check valve tilting disk	no.	0	
* foot valve hinged disc	no.	0	
* foot valve poppet disc	no.	0	
* reducer / expander	no.	0	
* entrance (projecting)	no.	0	
* entrance (sharp-edged)	no.	0	
* entrance (flush)	no.	0	
* exit (projecting)	no.	0	
* exit (sharp-edged)	no.	0	
* exit (rounded)	no.	0	

Suction Side Calculation Results			
Velocity	m/s	0.94	
Reynolds No.	----	112129	
Head Loss ( $\Delta h/L$ )	m/m	0.0034	Maximum
Source Pressure	m	19.603	44.107
Static Head	m	3.850	5.800
Total Pipe Loss	m	0.206	NA
Total Fitting Loss	m	0.000	NA
Heat Exchanger Loss	m	0.000	NA
Control Valve Loss	m	0.000	NA
Other Losses	m	0.686	NA
Metering Loss	m	0.000	NA
Acceleration Loss	m	0.000	NA
<b>Pump Suction Head</b>	<b>m</b>	<b>22.56</b>	<b>49.91</b>
<b>Pump Suction Pressure</b>	<b>bara</b>	<b>2.30</b>	<b>5.09</b>

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**PUMP DISCHARGE SIDE CALCULATION SHEET**


Discharge Condition		Common	Path 1	Path 2
Maximum Flow Rate	m <sup>3</sup> /hr	0.00	156.00	0.00
Destination Operating Pressure	bara	NA	2.25	0.00
Static Head	m	NA	17.90	0.00
Exchanger Pressure Drop	bar	0.000	0.350	0.000
Control Valve Pressure Drop	bar	0.000	0.700	0.000
Other Losses	bar	0.000	0.200	0.000
Metering Loss	bar	0.000	0.000	0.000
Acceleration Loss	m	0.000	0.000	0.000
Pipe Length	m	0	160	200
Nominal Pipe Size	inch	6	10	2
Pipe Schedule No.	----	40	40	40
Pipe Roughness (DEF.)	inch	0.00180	0.00180	0.00180
Fittings Quantity				
* tee flow thru	no.	0	0	0
* tee branch	no.	0	0	0
* elbow 90 deg LR	no.	0	0	0
* elbow 90 deg screwed	no.	0	0	0
* elbow 45 deg LR	no.	0	0	0
* elbow 45 deg screwed	no.	0	0	0
* close pattern return bend	no.	0	0	0
* gate valve	no.	0	0	0
* ball valve	no.	0	0	0
* globe valve	no.	0	0	0
* angle valve	no.	0	0	0
* butterfly valve (2" - 8")	no.	0	0	0
* butterfly valve (10" - 14")	no.	0	0	0
* butterfly valve (16" - 24")	no.	0	0	0
* check valve swing	no.	0	0	0
* check valve lift	no.	0	0	0
* check valve stop lift	no.	0	0	0
* check valve tilting disk	no.	0	0	0
* foot valve hinged disc	no.	0	0	0
* foot valve poppet disc	no.	0	0	0
* reducer / expander	no.	0	0	0
* entrance (projecting)	no.	0	0	0
* entrance (sharp-edged)	no.	0	0	0
* entrance (flush)	no.	0	0	0
* exit (projecting)	no.	0	0	0
* exit (sharp-edged)	no.	0	0	0
* exit (rounded)	no.	0	0	0

Discharge Side Calculation Results		Common	Path 1	Path 2
Velocity	m/s	0.0	0.9	0.0
Reynold 's No.	----	0	106342	0
Head Loss ( $\Delta h/L$ )	m/m	0.0000	0.0027	0.0000
Destination Pressure	m	NA	22.054	0.000
Static Head	m	NA	17.900	0.000
Total Pipe Loss	m	0.000	0.424	0.000
Total Fitting Loss	m	0.000	0.000	0.000
Heat Exchanger Loss	m	0.000	3.431	0.000
Control Valve Loss	m	0.000	6.861	0.000
Other Losses	m	0.000	1.960	0.000
Metering Loss	m	0.000	0.000	0.000
Acceleration Loss	m	0.000	0.000	0.000
<b>Total Head in Section</b>	<b>m</b>	<b>0.00</b>	<b>52.63</b>	<b>0.00</b>
<b>Total Pressure in Section</b>	<b>bara</b>	<b>0.00</b>	<b>5.37</b>	<b>0.00</b>
<b>Pump Discharge Head</b>	<b>m</b>	<b>52.63</b>		
<b>Pump Discharge Pressure</b>	<b>bara</b>	<b>5.37</b>		

**General Notes**

0) RICH AMINE IS AT THE BUBBLE POINT CONDITION.

1) 200 mm LLL + 3650 mm to pump centerline (this height was set by pump minimum NPSH of 3.0 meters.

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**PUMP CALCULATION RESULTS**

Pump Head Calculation		Rated
Pump Discharge Head	m	52.63
Pump Suction Head	m	22.56
Pump Differential Head	m	30.07
Pump Differential Pressure	bar	3.07
Pump Shutoff Pressure	bar <sub>g</sub>	7.91

NPSH <sub>a</sub> Calculation		
Suction Pressure	m	22.561
Vapor Pressure	m	19.603
NPSH <sub>a</sub>	m	2.958

Pump Power Calculation		
Hydraulic Power	kw	13.38
Breakhorse Power	kw	17.83
Electric Drive Power	kw	22.29

**Sketch**

