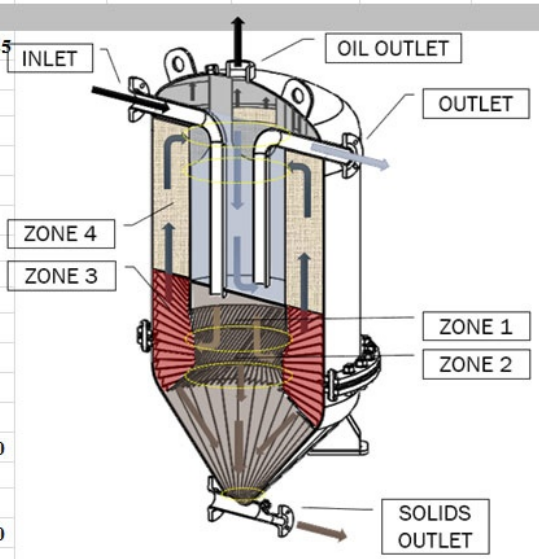
BOSS SEPARATORS — SOLID BOSS 32 SB

Job Information: FLOWORKS — **Flow Design Table**

Project Title:	32 SB Flow Design	**Job #:**	Proposal
Customer:	Generic	**Date:**	4/22/2016
Designer:	Richard Lewis	**Model**	32 SB

Fluid Information:

Terms:	Discription:	Known Value	Ideal Via. V
Q_{nom} =	Nominal Design Flow Rate (gpm)	25	25
Q_{in} =	Starting Flow Rate (gpm)	5	
n =	Step Size	2.5	
SG_c =	Carrier Specific Gravity*	1	
d_o =	Liquid Specific Gravity*	0.9	
d_s =	Solids Specific Gravity*	2.2	
T_F =	Fluid Temperature (°F)*	60	
ρ =	Density (Carrier) (slugs/ft3)	1.94E+00	
μ =	Carrier Dynamic Viscosity (lb*s/ft2)*	2.34E-05	
μ =	Carrier Dynamic Viscosity (cP)*	0.982	
D_1 =	Vessel I.D. (in)	32	
D_2 =	Internal Cylinder I.D. (in)	18	
H_2 =	Height Zone 2 (in)	6.75	
A_P =	Projected Plate Area (ft2)	0.48	
n_P =	Number Of Plates	100	100
Θ =	Plate Angle (degrees)	55	
H_3 =	Plate Height Above Flange (in)	6	
a_3 =	Plate Pitch From Vertical (in)		4.20



Flow Design Table

Flow Rate (GPM)	A		B		C		D		E	F	G	H
	Zone 1		Zone 2		Zone 3		Zone 4		Solid Particle Size With Plates (Micron)	Solid Particle Size Without Plates (Micron)	Oil Particle Size With Plates (Micron)	Oil Particle Size Without Plates (Micron)
	V (ft/s)	Re	V (ft/s)	Re	V (ft/s)	Re	V (ft/s)	Re				
5	0.0063	783.95	0.0042	32.84	0.0029	18.10	0.0029	282.22	10.3	36.6	35.8	126.9
7.5	0.0095	1175.93	0.0063	49.26	0.0044	27.15	0.0044	423.33	12.7	44.9	43.8	155.4
10	0.0126	1567.91	0.0084	65.68	0.0058	36.21	0.0058	564.45	14.6	51.8	50.6	179.4
12.5	0.0158	1959.88	0.0105	82.10	0.0073	45.26	0.0073	705.56	16.3	57.9	56.6	200.6
15	0.0189	2351.86	0.0126	98.51	0.0088	54.31	0.0088	846.67	17.9	*63.4*	62.0	*219.8*
17.5	0.0221	2743.83	0.0147	114.93	0.0102	63.36	0.0102	987.78	19.3	*68.5*	66.9	*237.4*
20	0.0252	3135.81	0.0168	131.35	0.0117	72.41	0.0117	1128.89	20.7	*73.3*	71.6	*253.7*
22.5	0.0284	3527.79	0.0189	147.77	0.0131	81.46	0.0131	1270.00	21.9	*77.7*	75.9	*269.1*
25	0.0315	3919.76	0.0210	164.19	0.0146	90.51	0.0146	1411.12	23.1	*81.9*	80.0	*283.7*
27.5	0.0347	~~4311.74~~	0.0231	180.61	0.0160	99.57	0.0160	1552.23	24.2	*85.9*	83.9	*297.5*
30	0.0378	~~4703.72~~	0.0252	197.03	0.0175	108.62	0.0175	1693.34	25.3	*89.7*	87.6	*310.8*
32.5	0.0410	~~5095.69~~	0.0273	213.45	0.0190	117.67	0.0190	1834.45	26.3	*93.4*	91.2	*323.5*
35	0.0441	~~5487.67~~	0.0294	229.87	0.0204	126.72	0.0204	1975.56	27.3	*96.9*	94.7	*335.7*
37.5	0.0473	~~5879.65~~	0.0315	246.29	0.0219	135.77	0.0219	2116.67	28.3	*~~100.3~~*	98.0	*~~347.5~~*
40	0.0504	~~6271.62~~	0.0336	262.71	0.0233	144.82	0.0233	2257.78	29.2	*~~103.6~~*	101.2	*~~358.9~~*
42.5	0.0536	~~6663.60~~	0.0357	279.12	0.0248	153.87	0.0248	2398.90	30.1	*~~106.8~~*	104.3	*~~369.9~~*
45	0.0567	~~7055.58~~	0.0378	295.54	0.0263	162.93	0.0263	2540.01	31.0	*~~109.9~~*	107.3	*~~380.6~~*
47.5	0.0599	~~7447.55~~	0.0399	311.96	0.0277	171.98	0.0277	2681.12	31.8	*~~112.9~~*	110.3	*~~391.1~~*
50	0.0630	~~7839.53~~	0.0420	328.38	0.0292	181.03	0.0292	2822.23	32.7	*~~115.8~~*	113.2	*~~401.2~~*
52.5	0.0662	~~8231.50~~	0.0441	344.80	0.0306	190.08	0.0306	2963.34	33.5	*~~118.7~~*	115.9	*~~411.1~~*
55	0.0693	~~8623.48~~	0.0462	361.22	0.0321	199.13	0.0321	3104.45	34.3	*~~121.5~~*	118.7	*~~420.8~~*
57.5	0.0725	~~9015.46~~	0.0483	377.64	0.0336	208.18	0.0336	3245.56	35.0	*~~124.2~~*	121.3	*~~430.3~~*
60	0.0756	~~9407.43~~	0.0504	394.06	0.0350	217.23	0.0350	3386.68	35.8	*~~126.9~~*	124.0	*~~439.5~~*
62.5	0.0788	~~9799.41~~	0.0525	410.48	0.0365	226.29	0.0365	3527.79	36.5	*~~129.5~~*	126.5	*~~448.6~~*
65	0.0820	~~10191.39~~	0.0546	426.90	0.0379	235.34	0.0379	3668.90	37.2	*~~132.1~~*	129.0	*~~457.5~~*
67.5	0.0851	~~10583.36~~	0.0567	443.31	0.0394	244.39	0.0394	3810.01	38.0	*~~134.6~~*	131.5	*~~466.2~~*
70	0.0883	~~10975.34~~	0.0588	459.73	0.0408	253.44	0.0408	3951.12	38.6	*~~137.0~~*	133.9	*~~474.7~~*
72.5	0.0914	~~11367.32~~	0.0609	476.15	0.0423	262.49	0.0423	~~4092.23~~	39.3	*~~139.5~~*	136.3	*~~483.1~~*
75	0.0946	~~11759.29~~	0.0630	492.57	0.0438	271.54	0.0438	~~4233.35~~	40.0	*~~141.9~~*	138.6	*~~491.4~~*
77.5	0.0977	~~12151.27~~	0.0651	508.99	0.0452	280.59	0.0452	~~4374.46~~	40.7	*~~144.2~~*	140.9	*~~499.5~~*

Laminar - Flow Conditions | Transitional - Flow Conditions | ~~STRIKE~~ | Turbulent Flow Conditions

SOLID BOSS

Design Table Explanation

The REI FloWorks Design Program defines the range of operating conditions for the SOLID BOSS solid separator. The upper part of the Table shows the design values, such as the nominal design flow rate, the carrier specific gravity, the solids specific gravity, the oil specific gravity, the number of plates, the plate surface area and other design values. The upper part of the Table also shows a drawing of the vessel segmented into 4 different zones. Zone 1 is the center pipe where the material enters the separator and also where the clean water exits the system. Zone 2 is where the carrier fluid turns and starts to come back up the outside of the center pipe. Zone 3 is the upper section of the circular inclined plates. Zone 4 is the area above the plates where the water discharges from the separator.

The bottom part of Table shows various flow conditions and defines the operating range for the separator. There are 2 columns for each Zone. The first column shows the velocity of the carrier fluid going through that Zone. The second column shows the Reynolds number. The Reynolds numbers are then equated to a flow condition – laminar, transitional or turbulent. The industry has established standards linking a Reynolds number to a flow condition. The following table shows those flow conditions:

	Laminar	Transitional	Turbulent
Re # for pipe	0-2100	2100-4000	> 4000
Re # for open channel flow (plates)	0-520	520-950	>950

Column 2 for each Zone is color coded to show the flow conditions at various flow rates. Green indicates laminar flow, yellow indicates transitional flow and if the number is crossed out that indicates turbulent flow.

Columns E, F, G and H show the particle size that can be removed at each flow rate. Columns E and F are for solids and Columns G and H are for oil. Columns E and G show the particle size that will be removed with inclined plates. Columns F and H show the particles size that will be removed before the inclined plates. The particles size that will be removed is calculated at the point where a specific micron size particle having a defined specific gravity is at its terminal velocity. Assuming laminar flow in the areas where separation takes place these particles will drop out of the carrier fluid. If the specific gravity of the particle goes up then the particle size that will be removed goes down and visa versa. The green area of Columns E and G represents ideal operating conditions. Yellow indicates cautionary operating conditions and if the line is crossed out the flow is turbulent and the particle size calculations will not be accurate. The system can be operated in the green areas of columns E and G. The system will typically operate in a range from 1% to 300% of its nominal rating. The simple explanation is that the system will operate continuously from 0 gpm to the design flow rate and will handle surges above that within the green range.

Disclaimer: These calculations are based on the stated specific gravity. A change in specific gravity of the particle will impact the flow conditions.

Contact Information:

BOSS SEPARATORS

info@recoveredenergy.com