COASTAL RELIABILITY SOLUTIONS

PLANNING JOURNAL

Honeywell Sundyne

RELIABILITY REALIZED

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VALUABLE PUMP FORMULAS

PRESSURE

Feet of Water X 0.4333	=PSI
(PSI X 2.31)/Sp. Gr.	=Feet of Water
(Ft. Head x Sp. Gr.)/2.31	=PSI
PSI x 6.9	=kPa
ATM x 14.7	=PSI
ATM x 33.9	=Feet of Water
ATM x 760	=mm Hg
kg/cm2 x 1.42	=PSI
Meters of Water x 1.42	=PSI
Bar x 14.5	=PSI
Inches of Hg x 0.491	=PSI

PIPE VELOCITY

Velocity in Feet per Second:	$\frac{\text{GPM x 0.321}}{\text{Pipe Area in Square Inches}}$
Rule of Thumb:	Typically, keep pipe velocities around 10 ft/second for good results.
Suction Piping:	Generally, have piping in one plane from source tank and have a straight run at least 10 times the pipes diameter leading into the pump suction.
Pipe Size:	Doubling the diameter of a pipe increases its capacity 4 times.

CENTRIFUGAL PUMPS

Liquid HP: $\frac{\text{GPM x ft. of Head x Sp. Gr.}}{3960}$

Brake HP: $\frac{\text{GPM x TDH x Sp. Gr.}}{\text{3960 x Pump Efficiency}}$

Efficiency Overall HP: $\frac{\text{BHP}}{\text{Motor Efficiency}}$

Estimated effects of viscosity on Centrifugal Pumps

SSU	FLOW	HEAD	EFFICIENCY
35	100%	100%	80%
500	95%	98%	80%
1000	92%	97%	70%

ROTARY POSITIVE DISPLACEMENT PUMPS

Liquid HP:	$\frac{\text{GPM x PSI}}{1714}$
Volumetric Efficiency:	$\frac{\text{Actual GPM}}{\text{Theoretical GPM}}$
Overall Pump Efficiency:	$\frac{\text{LHP}}{\text{BHP}}$
Mechanical:	$\frac{\text{Overall Pump Efficiency}}{\text{Volumetric Efficiency}}$

APPROXIMATE RPM @ FULL LOAD - FOR MEDIUM SIZED MOTORS

Poles	RPM (60 Hz)	Sync Speed	RPM (50 Hz)	Sync Speed
2	3500	3600	2850	3000
4	1750	1800	1450	1500
6	1150	1200	950	1000
8	850	900	700	750

Synchronous Speed (no load) Formula: $\text{RPM} = \frac{\text{Frequency(Hz) x 120}}{\text{Number of Poles}}$

INSULATION CLASS NEMA 1.15 SERVICE FACTOR

A	150 °C	221 °F
B	130 °C	266° F
F	155 °C	311 °F
H	180 °C	356° F

Maximum motor temperature including temperature rise plus 40° C ambient temperature

RULES OF THUMB FOR MOTORS

A motor develops 1.5 ft-lbs per HP @ 3600 RPM	A 3-phase motor draws 1.00 Amp per HP @ 557 Volts
A motor develops 3.0 ft-lbs per HP @ 1800 RPM	A 3-phase motor draws 1.25 Amp per HP @ 460 Volts
A motor develops 4.5 ft-lbs per HP@ 1200 RPM	A 3-phase motor draws 2.50 Amp per HP @ 230 Volts

$\text{HP} = \frac{\text{Torque (ft-lbs) x RPM}}{5252}$

$\text{Torque (in lbs)} = \frac{\text{HP x 63,000}}{\text{RPM}}$

PARTICLE SIZE COMPARISON

Mesh	Inch	Micron
3250	.0002	6
1600	.0005	14
750	.0010	25
325	.0016	40
250	.0024	62
200	.0029	74
180	.0033	85
150	.0041	100
120	.0046	118
100	.0055	149
80	.0070	179
50	.0117	300
40	.0150	385
30	.0200	513
24	.0280	718
20	.0340	872
18	.0390	1000
16	.0450	1154
14	.0510	1308
12	.0600	1538
10	.0750	1923
8	.0970	2488
6	.1320	3385
4	.1590	4077
2	.2030	5205

1 Micron = 10^{-6} Meters
1 Micron = 3.9×10^{-5} inch

ATMOSPHERIC PRESSURE

Altitude in Feet	Pressure in PSIA
0	14.70
100	14.64
300	14.54
500	14.43
700	14.33
1,000	14.17
1,500	13.92
2,000	13.66
3,000	13.17
4,000	12.69
5,000	12.23
7,000	11.34
10,000	10.11
15,000	8.29
20,000	6.76
25,000	5.45
30,000	4.36
40,000	2.72
50,000	1.68
60,000	1.04

VISCOSITY

CONVERSIONS:

SSU*	= Centistokes x 4.55
Degrees Engler*	= Centistokes x 0.132
Sec. Redwood 1*	= Centistokes x 4.05
1 Stoke	= 100 Centistokes
1 Poise	= 100 Centipoises
Centistokes	= Centipoise/Sp. Gr.

*Where Centistokes are greater than 50

Definitions:

Newtonian fluids are unaffected by shear, e.g. water mineral oil.

Non-Netownian fluids are affected by shear (5 types).

Bingham-Plastic fluids have an exact shear point which once exceeded, viscosity decreases.

Pseudo-Plastic fluids have no exact yield point, but instead, viscosity decreases as the magnitude of shear rate increases.

Dilatant fluids viscosity increases as the magnitude of the shear rate increases, e.g. printing ink, candy compounds.

Thixotropic fluids decrease in viscosity both in relation to the shear magnitude and the period of time subjected to shear. Viscosity might also depend on a previous shear condition, e.g. drilling mud, starches, paint.

Rheopectic fluids increase viscosity both in relation to the shear magnitude and the period of time subjected to shear, e.g. some greases.

AFFINITY LAWS FOR CENTRIFUGAL PUMPS

These formulas can be used to estimate capacity, head and BHP for a pump speed or impeller diameter when a curve is not readily available:

1. Flow is directly proportional to the ratio of impeller speed:

$$GPM_2 = \frac{GPM_1 \times RPM_2}{RPM}$$

2. Head is directly Proportional to the square of the ratio of impeller speed:

$$Head_2 = Head1 \times \left(\frac{RPM_2}{RPM_1}\right)^2$$

3. The HP is directly proportional to the ratio of impeller speed:

$$BHP_2 = BHP_1 \times \left(\frac{RPM_2}{RPM_1}\right)$$

4. Flow is directly proportional to the ratio of impeller diameter:

$$Flow_2 = Flow_1 \times \left(\frac{\text{Impeller Diameter}_2}{\text{Impeller Diameter}_1}\right)^2$$

5. Head is directly proportional to the square of the ratio of Impeller diameter:

$$Head_2 = Head_1 \times \left(\frac{\text{Impeller Diameter}_2}{\text{Impeller Diameter}_1}\right)^2$$

6. The HP is directly proportional to the cube of the ratio of impeller diameter:

$$BHP_2 = BHP_1 \times \left(\frac{\text{Impeller Diameter}_2}{\text{Impeller Diameter}_1}\right)^2$$

COASTAL RELIABILITY SOLUTIONS LLC

PROUDLY REPRESENTING

INDUSTRIAL & MUNICIPAL PUMPS - MECHANICAL SEALS - MECHANICAL PACKING
NON-METALLIC TANKS - HEAT EXCHANGERS - COMPRESSORS

ABAQUE™ PERISTALTIC HOSE PUMP
ALLEN INDUSTRIES
ANSIMAG
Aca Aßmann™ Quality: First and Forever
Blackmer®
flexaseal ENGINEERED SEALS AND SYSTEMS, LLC
grindex
HEXONIC HEAT EXCHANGERS
Honeywell Sundyne
HMD KONTRO Sealless Pumps
Landustrie Water Treatment Solutions
Layne PUMPS, INC.
Lutz® The Fluid Managers
Jesco®
MARIC FLOW CONTROL AUSTRALIA
MEGATOR Pumps 2000
MID-AMERICA PUMP AND SUPPLY, INC.
MOUVEX
Myers®
Palmetto® Inc.
Pentair Industrial Pumps
PENTAIR AURORA
PENTAIR FAIRBANKS NIJHUIS®
PITBULL INDUSTRIAL PUMPS
PPI
SUMMIT™ PUMP, Inc
TESLA DISK PUMPS™
VERSAMATIC®
VERTIFLO PUMP COMPANY

RELIABILITY REALIZED

Emergency 24 Hr. Service

Technical Support ▪ Design ▪ Installation ▪ Fabrication ▪ Repair

Visit our Website: www.coastalreliability.com E-Mail: sales@coastalreliability.com

PUMPS	Abaque	Industrial Hose Pumps (Peristaltic)
	Ansimag	ANSI Non-Metallic Pumps, Sub-ANSI Non-Metallic, Self-Priming Non-Metallic Pumps and Non-Metallic Mag-Drive Pumps
	Aplex Myers	Medium and Heavy Duty Reciprocating Pumps (up to 5500 PSI and up to 600 GPM)
	Aurora	ANSI Centrifugal Pumps, Regenerative Turbine Pumps, End Suction Pumps, Inline Pumps, Multi-Stage Vertical Pumps, Split Case Pumps, Boiler Feed Pumps, Sump Pumps, Sewer Pumps, Booster Systems and Condensate Systems
	Blackmer	Positive Displacement Sliding Vane Pumps, Mouvex CIP Pumps, System One Pumps, Mag-Drive Pumps, Abaque Peristaltic Hose Pumps, Horizontal and Vertical Pumps and Vortex Pumps
		Internal Gear Pumps, Mag-Drive Gear Pumps, Chemical Gear Pumps, Asphalt Gear Pumps
	Fairbanks Nijhuis	Turbine Pumps, Split Case Pumps, Vertical Inline Pumps, Propeller Pumps, Solids-Handling Pumps, Submersible Pumps and Fire Pumps
	Grindex	Dewatering Pumps and Electric Submersible Pumps (up to 370’ and up to 5200 GPM)
	HMD Kontro	Metallic Mag-Drive Pumps and High Pressure Mag-Drive Pumps
	Jesco Pump (Lutz)	Industrial and Municipal Metering Pumps, Drum Pumps, AOD Pumps and Non-Metallic Pumps
	Landustrie	Submersible Pumps, Centrifugal Pumps, Vortex Pumps, Screw Pumps and Submersible Mixers
	Layne Mid-America	Vertical Pumps and Turbine Pumps
	Megator / P2K	Sliding Shoe Pumps, Rotary Lobe Pumps, Floating Strainers, Oil Recovery Units & Skimmers, Pneumatic Diaphragm Pumps and Double Diaphragm Pumps
	Myers	Submersible Pumps, Centrifugal Pumps, Vortex Pumps and Self-Priming Pumps
	Nikkiso / LEWA	Non-Seal® Pumps, Canned Motor Pumps, API-685 Hydraulically Actuated Diaphragm Pumps
	Pitbull Pumps	Air-Operated Positive Displacement Pumps
	Summit Pump	ANSI Pumps, Regenerative Turbine Pumps, Self-Priming Pumps, Trash Pumps, Slurry Pumps, Progressive Cavity Pumps, Split Case Pumps and Aftermarket Parts
	Sundyne / Marelli	Heavy Duty Split Case API 610 Pumps, Multi-Stage Pumps, End-suction Horizontal Single and Double Volute Pumps, Axially Split Pumps and Submersible Pumps
	Sundyne / Sunflo	High Speed/High Pressure Pumps, API Pumps, High Speed Compressors, Blowers and Custom Integrated Skid Systems
	Versa-Matic	AODD Pumps (Bolted, Clamped, Non-Metallic, Metallic and Sanitary 3A)
	Vertiflo Pumps	Vertical Vortex Pumps, Cantilever Pumps, High Chrome Iron Pumps. Centrifugal Pumps and Self-Priming Pumps
MECHANICAL SEALS, PACKING & SEALING DEVICES	Flex-A-Seal	Mechanical Seals, Packing, Gaskets and OEM Quality Repairs of All Types and Manufactures
		Triple Lip Mechanical Seals and Dry Run Mechanical Seals
	Palmetto	Pump and Valve Packing (Graphite, GFO Fiber, PTFE, Carbon, Phenolic and more), Custom Cut and Sheet Gasketing and Non-Asbestos Gasketing
	Seal Pots	Barrier Fluid Pots (ANSI/API, Heat Exchangers, Forced Circulation Loop Systems)
HEAT EXCHANGERS	Hexonic	Shell & Coil, Shell & Tube, Brazed Plate, SafePlate Double Wall, Plate & Frame,CIP/3A Sanitary, TEMA, Custom and Bio-Mass Heat Exchangers
COMPRESSORS	Blackmer	Reciprocating Compressors, Oil-Free Compressors and Single and Double Cylinder Compressors
	PPI	Sealless Diaphragm Compressors
	Sundyne	Centrifugal Compressors, Integrally Geared Compressors, Multi-Stage Compressors and Vertical Line Mounted Compressors
TANKS	Allen Industries	Fiberglass Reinforced Plastic Tanks and Repair Service
	Assmann	Polyethylene Tanks, Linear and Crosslink, Single Wall Tanks, Double Wall Tanks, Conical Bottom Tanks, Vertical and Horizontal Tanks, Full Drain (FDO) Tanks, Chemical Feed Systems and Secondary Containment Tanks (ISO Certified, NSF Approved for Water and Chemical Storage)
EXPANSION JOINTS	FlexHose	Metal Bellows Expansion Joints and Custom Designed Expansion Joints
DAMPENERS	LUTZ Jesco Versamatic	Pulsation Dampeners, Suction Stabilizers, Surge Absorbers and Expansion Compensators
VALVES	Maric Valves	Precision Flow Control Valves and Constant Flow Valves (Regardless of Pressure)
	Valves	Ball Valves, Butterfly Valves, Flapper Valves, Gate Valves, 3-Way Valves, Pinch Valves, Knife Valves, Sanitary Valves, Back Pressure and Pressure Relief Valve

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DAILY NOTES / PROJECT NAMES:

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JAN FEB MAR APR MAY JUN 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
JUL AUG SEP OCT NOV DEC 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

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