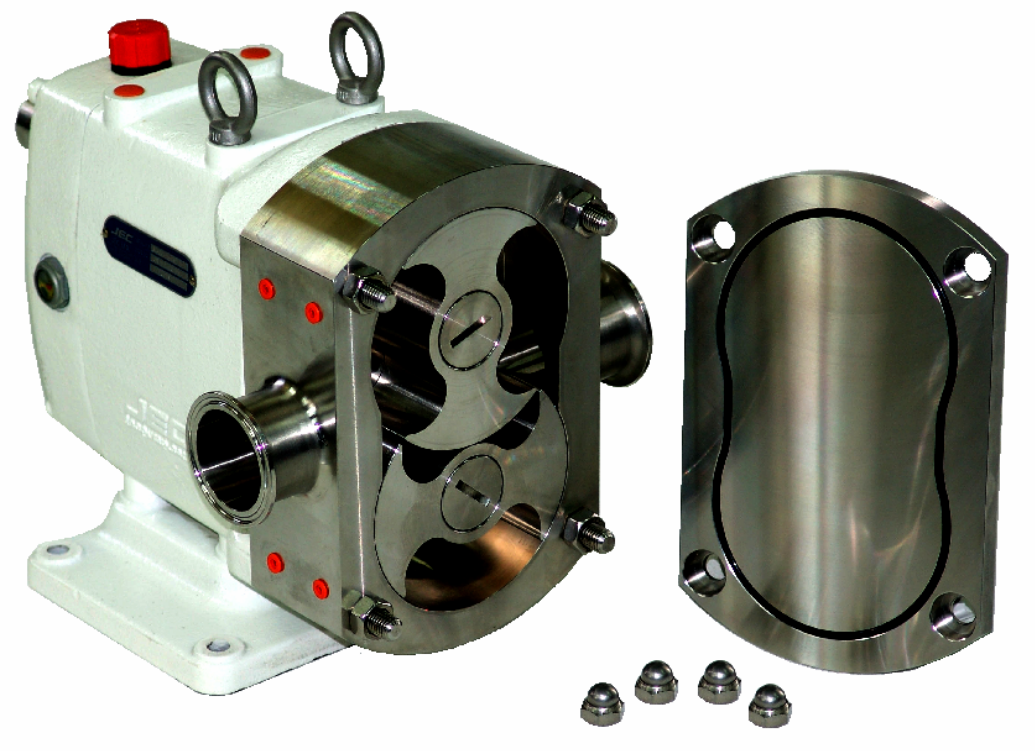
Q-Pumps S.A. de C.V.

How to select Rotary Lobe Pumps

ZL Series



2008

HOW TO SELECT ROTARY LOBE PUMPS

Water performance selection:

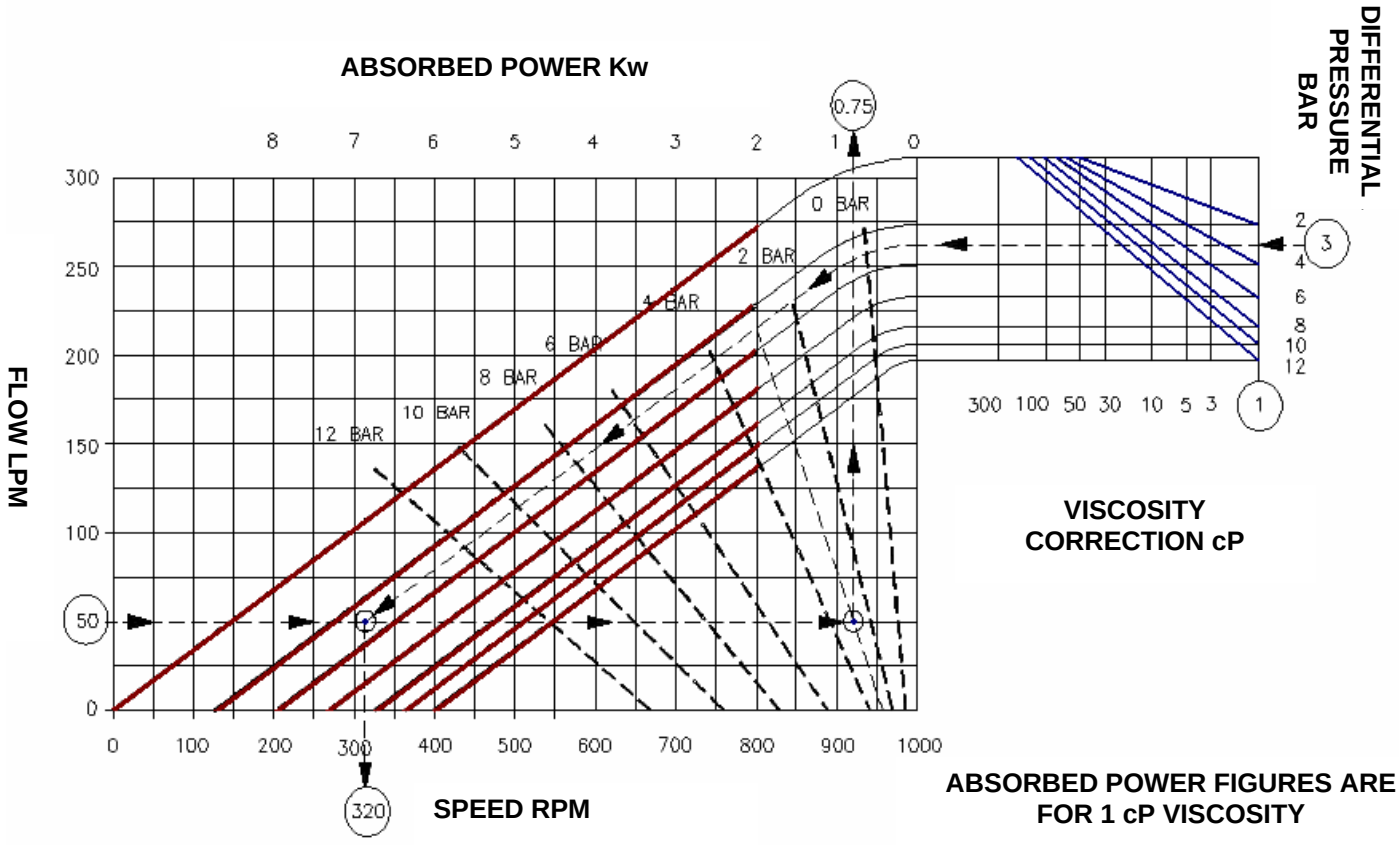
Step 1 – Speed, rpm

Starting from the vertical left hand (flow rate) axis, at the required capacity, plot a line horizontally across to intersect the solid flow/speed performance lines at the differential pressure. At this intersection, plot a line vertically down to the bottom speed axis and read off the pump rpm.

Step 2 – Power, kW

Commencing again from the left hand (flow rate) axis, at the specified capacity, plot a line horizontally across to intersect the dotted flow/absorbed power lines at the differential pressure. At this intersection plot a line vertically upwards to the top absorbed power axis and read off the absorbed kW.

WATER CAPACITY AND ABSORBED POWER GRAPH



Performance curve model ZL-220-34-12.

For example, 50 LPM, 1 cP against a differential pressure of 3 bar, using a ZL-220 lobe pump:

Steep 1 – Speed

Working from the flow axis at 50 LPM dotted a line horizontally across to intersect the dotted 3 bar, between the 2 bar and 4 bar flow/speed performance lines. Plotting vertically down from this intersection the pump rpm can be read off the speed axis equal to 320 rpm.

Steep 2 – Power

Starting from 50 LPM on the flow rate axis dotted a line horizontally across to intersect the dotted 3 bar, between the 2 bar and 4 bar flow/absorbed power lines. At this intersection dotted a line vertically upwards to the brake horsepower axis and read off the absorbed kW of 0.75.

Viscosity liquid performance selection:

Steep 1 – Speed, rpm

When handling other than water-like liquids the viscosity correction monogram at the top of the performance graph (capacity vs. speed lines) should be used.

Case 1: If viscosity of 1 cP, differential pressure 12 bar then, select the pump speed from the bottom 12 bar line.

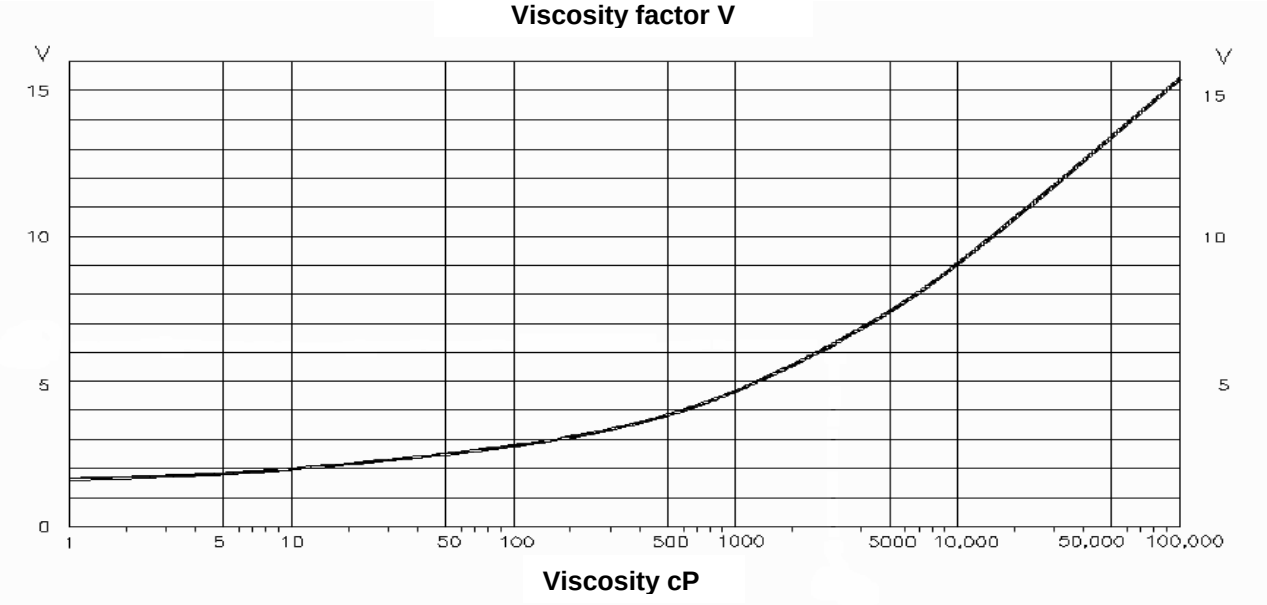
Case 2: If viscosity of 300 cP, differential pressure 6 bar then, select the pump speed from the 0 bar line.

Case 3: If viscosity of 20 cP, differential pressure 8 bar then, select the pump speed from the 2 bar line.

It can be seen from the graph ZL-220/34/12 that when exceeding 300 cP the slip in the pump is negligible and the 0 pressure line can be used for any differential pressure.

Steep 2 – Power, kW

To calculate the total power absorbed to move the fluid with different viscosities from water, it is necessary to determinate the viscosity factor “V”. Use the next table and future formula to calculate the power.



Graph to determinate the viscosity factor.

Use the next formula to calculate the power:

$$N = \frac{((2 \times P) + V) \times n \times C_{ZL}}{1000}$$

Where:

P = Pressure $\left({}^{kg}/_{cm^2} \right)$

V = Viscosity factor

n = Speed (rpm)

C = Flow $\left({}^{lt}/_{rev} \right)$

As we know the capacities per revolution of each model from the ZL series, now we can select and determinate the size of the pump:

ZL	110	115	120	220	225	330	340	440	450
C_{ZL}	0.05	0.12	0.21	0.40	0.62	1.02	1.44	2.27	3.34

Rotary Lobe Pumps

Select from the table using the viscosity, the maximum recommended speed for each pump size.

Viscosity (cP)	Model								
	110	115	120	220	225	330	340	440	450
	Max. Recommended speed rpm								
1 - 100	1000	800	800	700	700	600	600	500	500
100 - 1,000	667	533	533	467	467	400	400	333	333
1,000 - 5,000	417	333	333	292	292	250	250	208	208
5,000 - 10,000	250	200	200	175	175	150	150	125	125
10,000 - 20,000	167	133	133	117	117	100	100	83	83
20,000 - 50,000	117	93	93	82	82	70	70	58	58
50,000 - 100,000	83	67	67	58	58	50	50	42	42

Example:

Select a Rotary Lobe Pump with the next characteristics: cream at 2000 cP, flow required of 70 LPM, against a differential pressure of 8 kg/cm2.

To calculate the pump speed in rpm, divide the 70 LPM among each model's capacity per revolution:

Model ZL	110	115	120	220	225	330	340	440	450
C_{ZL}	0,05	0,12	0,21	0,40	0,62	1,02	1,44	2,27	3,34
Speed rpm	1400	583	333	175	113	69	49	31	21

Compare every pump model and determinate the best choice, using the maximum recommended speed.

For this case, a ZL120 pump is the best choice with a speed of 333 rpm.

To calculate the power use the formula using the data:

$P = 8 \left(kg/cm^2 \right)$

V(2000 cP) = 5.6

n = 333 (rpm)

C_{ZL}(ZL120) = 0.21 $\left(lt/rev \right)$

$$N = \frac{((2 \times 8) + 5.6) \times 333 \times 0.21}{1000} = \underline{1.51\ Kw}$$

QUESTIONNAIRE

Customer: _____

_____

_____ Date:_____

Quantity: _____ set

Pumps/Blender: Model no. _____

Capacity: _____ Units _____

Pressure head: _____ Units _____

Impeller diameter: _____ Units _____

Product: _____

Specific gravity: _____ Units _____

Concentration: _____ Units _____

Viscosity: _____ Units _____

Temperature _____ Units _____

Hard particles: _____

Mechanical seal (shaft seal)

Seat ring:	Ceramic _____	SiC _____	TC _____
Rotary ring:	Carbon _____	SiC _____	TC _____
O-rings:	NBR _____	EPDM _____	Viton _____
Water flushing:	Yes _____	No _____	

Electric motor

Power: _____	RPM _____	Hz _____	Volt _____
Type:	TEFC _____	EG3 _____	D2G4 _____
Without motor	Yes _____	No _____	

Connections

Inlet: Dimension: _____ Type: _____

Outlet: Dimension: _____ Type: _____

Special design

Drain on casing version:	Yes _____	No _____	Position no _____
Base mounting version:	Yes _____	No _____	
Frame mounting version:	Yes _____	No _____	
Transportable version:	Yes _____	No _____	

Remarks: _____

_____

_____

_____

_____

_____

Signature