CHEMPUMP
A DIVISION OF TEIKOKU USA INC.

ENGINEERING DATA SHEET

Rating of Chempump Motors		
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The selection of the proper pump and motor size for a given set of hydraulic conditions for a canned motor differs quite a bit from the procedure for selection of a conventional motor for a conventional pump and motor. This paper shows the method used to establish the electrical ratings for Chempump motors, along with other facts affecting Chempump motor performance.

A. Motor Ratings

Chempumps, as do other sealless pumps, require a fluid circulated through the motor section to remove heat from the motor section and lubricate the bearings. To allow for this, the standard air gap in the motor is widened to (1) install a non-magnetic liner in the stator to prevent contact with the fluid being pumped and the stator windings, (2) installation of a non-magnetic sleeve around the rotor to eliminate the possible corrosive effect of the fluid being pumped with the rotor armature, and (3) allow for a fluid gap between the rotor sleeve and stator liner to permit sufficient fluid circulation through the motor section.

By widening this air gap, the efficiency of the motor is reduced. This reduction in efficiency is similar to the mechanical seal friction and coupling losses in a conventional pump which must be overcome by additional motor work.

The temperature of the fluid being circulated through the motor section has a great deal to do with the rating of Chempump motors. The life of a Chempump motor is mainly dependent on a combination of the temperature of the fluid flowing through the motor section and the electrical loading of the motor.

Through testing of the various motor sizes, temperature limits and work load ratings (KW ratings) have been established for each motor size. This is done by measuring the winding temperature with thermocouples while the unit is in operation, handling fluid at various temperatures. When the temperature of the motor windings reach the NEMA rated temperature for the class of insulation, the fluid temperature is recorded as the maximum fluid temperature for that insulation. At the same time, KW and amp readings are taken in order to establish the proper electrical ratings. It should be noted that these tests are conducted without the stator being oil filled. With oil filling, the dissipation of heat out of the motor windings is improved, resulting in a lower stator winding temperature level and increasing motor life beyond NEMA's standards.

B. Formulas Used

In establishing the data shown on a Chempump curve, the following formulas are used in ascertaining efficiencies and motor ratings:

1) The overall efficiency of a Chempump is found through the following:

(a) Liquid horsepower (output) = $\frac{\text{(GPM) (Head in feet) (Sp.Gr.)}}{3960}$

(b) Electrical Horsepower (input) = $\frac{\text{Watts}}{746}$

(c) Efficiency = $\frac{\text{Output}}{\text{Input}}$ $\quad\quad$ $\frac{\frac{\text{(GPM) (Head in Feet) (Sp.Gr.)}}{3960}}{\frac{\text{Watts}}{746}}$

or, Efficiency = $\frac{\text{(.189) (GPM) (Head in Feet) (Sp.Gr.)}}{\text{Overall Efficiency}}$

2) From the efficiency formula, the watt draw can then be calculated for any hydraulic load when the overall efficiency is known and expressed as a decimal (40% = 0.40).

$$\text{Watts} = \frac{\text{(.189) (GPM) (Head in Feet) (Sp.Gr.)}}{\text{Overall Efficiency}}$$

C. Oil Filling

As standard, all Series G stators for 150 psi and 300 psi service are oil-filled and fitted with a relief valve. The following types of oil are approved for use in oil filling Chempump motors:

	Type & Manufacturer	**Max Temperature**
Fluorocarbon Oil	FC-75	+150
	FC-43	+300
Silicone Oil	GE - SF - 96	+450
	Dow Corning-510	
Therminol FR-2	Monsanto	+450