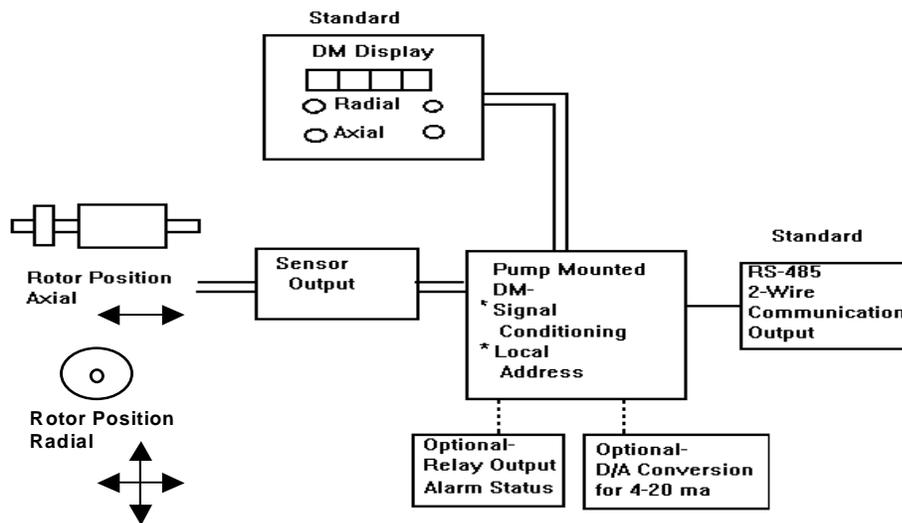# *Technical Data Sheet TDS-002*

IntelliSense Diagnostic Monitoring System

Description

The functional operation of the Chempump IntelliSense diagnostic monitoring system, US patent number 5,696,444, is shown in *Figure 1.*

Figure 1

Any change in rotor position, in either the axial or radial direction, causes a change in the sensor output. This signal is transmitted to the IntelliSense signal-conditioning module where the sensor output is processed and converted to a high level signal. The output signal is compared to calibration data for the as new, or baseline, condition. Movement outside these preestablished boundaries is interpreted as bearing wear. The percentage wear corresponding to this movement is indicated on the pump-mounted, local IntelliSense display.

Chempump has determined the maximum allowable radial and axial displacement that can be tolerated on the NC Series pumps. The allowable radial displacement, 0.014" includes the nominal fluid gap between the stator and rotor plus the maximum positional tolerance of the rotor without coming in contact with the stator liner.

The allowable axial displacement, 0.025" is based on impeller axial clearance and axial thrust bearing wear thickness without any metal-to-metal contact. The digital output on the display is configured to show the percentage of bearing wear that has occurred. For example, when the digital display indicates 10% radial wear, the rotor shaft has been displaced from its original position by 10% of the allowable travel (approximately .0014"). In an axial direction, 10% axial wear corresponds to about .0025" thrust bearing wear.

Chempump's IntelliSense diagnostic system offers the sealless pump user an unprecedented feature of knowing the location of the rotor assembly with unheard of accuracy. This system detects the axial position of the rotor within 0.002" and the radial position to within 0.001". This diagnostic system is superior to any bearing wear detector currently available, especially those that operate with a single point failure. Bearing wear devices that operate by wearing through a fixed thickness can only alarm at a single point. In order to give advance warning to replace bearings, the alarm point is set at no greater than 50% of allowable wear. No data is available to determine changing wear rates. Since the IntelliSense diagnostic monitoring system provides real time data, wear trends can be established to determine precise preventive maintenance schedules and lowest operating cost for the pump.

IntelliSense Diagnostic Monitor Remote Output

The IntelliSense diagnostic monitor has been designed to accommodate a variety of output options. The IntelliSense diagnostic monitor can be configured to match existing or future plant instrumentation without significant modification.

RS-485 Output

An RS-485 digital output is an option with the IntelliSense diagnostic monitoring system. This system is a two-wire, bidirectional communication system that is used to support instrumentation and control functions. The relatively low voltage output signal is generally considered intrinsically safe. With special software supplied by Chempump, the host computer can send instructions to or request data from the pump-mounted module, and the IntelliSense diagnostic monitor can respond over the same lines. A significant advantage of the RS-485 system is that data can be transmitted long distances (up to 4,000ft.). Also, each installation has its own unique address. Setting the address is as simple as changing dipswitches located inside the weatherproof housing of the IntelliSense.. Accessing a Chempump equipped with the IntelliSense diagnostic monitoring system from a host computer allows real time data to be available for diagnostic or trending purposes.

Analog Output

A 4-20mA analog output can be obtained from the IntelliSense module with the addition of an optional assembly, which can be easily added to the basic unit. The same high quality signal used to generate the digital output will be used to provide two channels of analog output, one representing radial bearing wear and the other axial wear. Other methods of indicating rotor position using the 4-20mA outputs are possible. A terminal strip and separate junction box are provided to connect to a standard two-wire instrumentation circuit. These are two methods of interconnecting the 4-20mA outputs to the user, and these are detailed on TDS 003.

When using the analog output option, standard precautions to protect the quality of the output signal are recommended. All analog common leads should be run separately form digital common leads and be tied together at only one point. Lead wires should be shielded, and the shield ground referenced to the distributed control or instrumentation system.

Local Relay Output

As another available option, output from the IntelliSense diagnostic monitor can be used to trip an alarm relay when either axial and/or radial wear exceeds 50% of the allowable bearing wear. The normally open or closed relay can be mounted next to the IntelliSense in a separate junction box and pilot-duty terminals are provided for connection to an external alarm.

As compared to the RS-485, and even the 4-20mA output, the relay provides a lesser quantity of information. For applications needing only single point alarms, adding the alarm relay may be sufficient to protect the pump from excessive bearing wear that could result in catastrophic failure.