A New Generation of Cryogenic Intelligence

ACD's CryoSMART System introduces a technology engineered to monitor trailer pump operation and minimize customer downtime by alerting the operator of potential problems. System Monitoring And Remote Tracking (SMART) are integral features to the CryoSMART System's design, which consists of the SMARTscreen, SMARTlink, SMARTconnection, and CryoSMART Website (see Figure 1).

Protecting our customers' interests was a goal set by ACD when it first began the development of a product capable of detecting and predicting future failures in cryogenic liquid transfer. The industrial gas transportation business relies heavily on the performance of cryogenic trailer transfer pumps in day to day operations. Failure to successfully transfer liquid to or from delivery vehicles bears considerable economic consequences.

Conjointly, the system monitors parameters for trailer pumps powered by ACD Lectran, hydraulic, or jackshaft (Pony) type systems to ensure operation within a specified range of predetermined parameters. To enable remote fleet management, the system provides automated email alerts notifying either ACD's service network or customer fleet locations of pending failures.

Select The Type of System

Lectran

Hydraulic

Auxiliary

Sensor Diagnostics

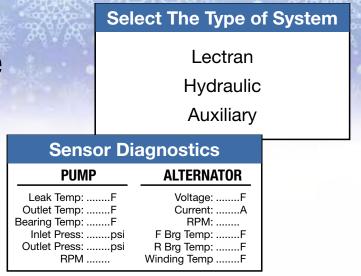| PUMP	ALTERNATOR
Leak Temp: ....F	Voltage: ....F
Outlet Temp: ....F	Current: ....A
Bearing Temp: ....F	RPM: ....
Inlet Press: ....psi	F Brg Temp: ....F
Outlet Press: ....psi	R Brg Temp: ....F
RPM	Winding Temp ....F

Figure 2. SMARTscreen System Selection and Sensor Diagnostics.

trailer's electrical system (8 to 30 VDC) and accepts liquid transfer information provided by various sensors located on components critical to the delivery process.

Monitored performance includes: pump speed, suction and discharge pressure, mechanical seal area, discharge, and bearing temperatures (via 4-20 mA pressure sensors and RTDs). For Lectran systems, the alternator also is monitored to ensure the
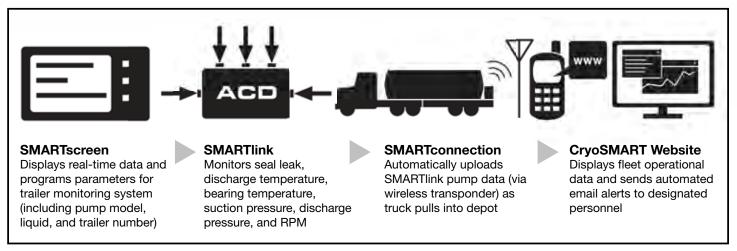

SMARTscreen
Displays real-time data and programs parameters for trailer monitoring system (including pump model, liquid, and trailer number)

SMARTlink
Monitors seal leak, discharge temperature, bearing temperature, suction pressure, discharge pressure, and RPM

SMARTconnection
Automatically uploads SMARTlink pump data (via wireless transponder) as truck pulls into depot

CryoSMART Website
Displays fleet operational data and sends automated email alerts to designated personnel

Figure 1. CryoSMART System Process.

SMARTscreen
Remote tracking capabilities are first initiated through the mobile interface terminal (SMARTscreen), which programs equipment parameters such as the pump model, serial number, product, type of power system, and customer trailer number (see Figure 2). Designed as a handheld touch screen, the SMARTscreen is powered by the tractor/trailer SMARTlink and can also be used to upgrade existing SMARTlink firmware or display real-time data for training and troubleshooting.

SMARTlink
The CryoSMART System's main control unit (SMARTlink) is a micro processor based intelligent system stationed on the trailer, capable of receiving, storing, and ultimately transmitting pump information to the website. The SMARTlink is powered by the

voltage, currents, speed and temperatures all operate within given ranges. Information stored in the SMARTlink control module is then automatically transmitted from a transponder to a computer terminal (SMARTconnection) located at the depot when the transport vehicle returns, which can be easily reviewed online by the plant manager (see Figure 3).
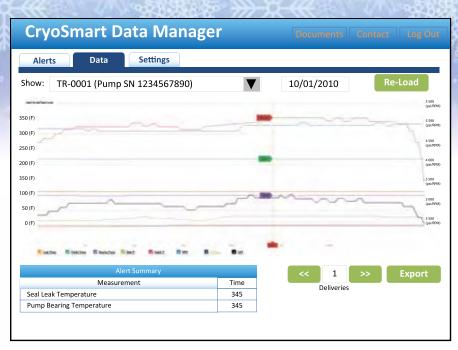
Figure 3. SMARTlink Data Transmitted to Website.

Data recording starts:
- Pump temperature ≤ 100°F
- Pump RPM ≥ 100 RPM
- Pump discharge pressure ≥ 100 PSI

Data recording stops:
- Pump temperature ≥ -100°F
- Pump RPM ≤ 100 RPM
- Pump discharge pressure ≤ 100 PSI

SMARTconnection

Consisting of a transponder and industrial PC, the SMARTconnection transmits the information stored in the SMARTlink control module to the CryoSMART website. The wireless transponder (installed at the depot) receives a signal from the SMARTlink when the trailer arrives and then transmits the data to a compact PC installed onsite. Using embedded firmware, the PC automatically uploads the SMARTlink data to the CryoSMART website for secured customer access.

CryoSMART Website

In order to provide accessible fleet management, the CryoSMART website sorts and manages all recorded trailer data in a user-friendly online database (see Figure 4). With CryoSMART Mobile, customers are able to access a mobile version of the website and receive system status notifications from any worldwide location.

Secured log-in and password protection allow customers to safely view and manage fleet data according to established administrator/user level. To enable remote fleet management, the CryoSMART website provides automated email alerts upon detection of abnormal operating conditions, including automatically generated graphs and reports with Microsoft Excel export capabilities, PDF manuals, technical support contact information, and advanced sorting preferences by location/region, trailer number, date range, or alert type.

The Future of Cryogenic Liquid Transfer

ACD's CryoSMART System introduces the advanced technology capable of predicting and preventing liquid transfer failures. Customers can now receive notification when operation exceeds given parameters, allowing them to schedule exchanges or repairs of the pump and/or power system. Based on usage and performance trends, fleet operators can anticipate system behavior and initiate preventative pump maintenance.

This new generation of cryogenic intelligence heralds a future in which customer downtime will be viewed as an anomaly—a future where maximum efficiency and full system visibility will become the paradigm for the industrial gas transportation business.

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Figure 4. CryoSMART Website Alert Management Database.