



Approval #

990050-U (Replaces 980085-U)

Safety & Buildings Division  
201 West Washington Avenue  
P.O. Box 2689  
Madison, WI 53701-2689

## Wisconsin Material Approval

Material

Red Jacket Tank and Line Leak  
Detection Systems

Manufacturer

The Marley Pump Company  
Red Jacket Mechanical  
500 East 59th Street  
Davenport, IA 52807

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### SCOPE OF EVALUATION

The XLP, DLD, XLD, FX1, FX2, FX1D, FX2D, FX1V, FX2V, FX1DV, FX2DV, CPT, and Big Flo systems were evaluated for use in hourly monitoring of rigid piping in accordance with **s. Comm 10.615 (1)**. The XLP, FX1, FX2, FX1V, FX2V, FX1DV, FX2DV, CPT, and Big Flo systems were also evaluated for use in hourly monitoring of flexible piping in accordance with **s. Comm 10.615 (1)**.

The CPT was evaluated for use as a line tightness testing method for rigid and flexible piping in accordance with **s. Comm 10.615 (2)**.

The CPT was evaluated for use in continuous monthly monitoring of rigid or flexible piping in accordance with **s. Comm 10.615 (3)**.

### DESCRIPTION AND USE

### CPT Line Leak Detection System

The CPT system may be used on lines containing gasoline, diesel, aviation fuel, alcohol and their blends with gasoline, #4 fuel oil and some solvents. The control unit is a microprocessor controlled, automatic line leak detector that differentiates between the types of signals produced by thermal contraction, line leaks and trapped air. The system monitors the product line between the tank and dispenser, including pump manifold and discharge line.

Tests are initiated after each operation of the submersible pump and may be conducted on demand. Annual line tightness testing may be manually initiated.

Time and pressure are both monitored by the console with the results displayed continuously on a liquid crystal display. The microprocessor stores information, determines if a leak exists and shuts down the system if a leak is detected. The control unit may be programmed to transmit leak alarm conditions or daily status reports to a remote location through a modem.

Three levels of tests are conducted automatically in the following sequence:

1. A Catastrophic Level Test is automatically conducted each time the pump is turned on. Large leaks of the order of 10 gallons per hour are detected in approximately eight seconds.
2. If the system passes the catastrophic level test, a Standard Level Test and a Precision Level Test are conducted sequentially after the pump is shut off. These tests will detect leaks small enough to meet the monthly monitoring and annual tightness test requirements specified in the EPA test protocol.
3. A Precision Level Test that will detect leaks as small as 0.1 gallons per hour in 35 minutes is conducted if the system passes the standard level test and the pump remains off for the required time period.

The CPT uses a precision functional element to hold the line pressure at 11 to 22 psi after the pump is shut off. The precision functional element is normally installed directly in the submersible pump for lines up to 4 inches in diameter. The CPT system includes a high pressure algorithm.

### XLP, DLD, and XLD Line Leak Detection Systems

The Red Jacket XLP, DLD and XLD line leak detectors may be used on systems containing gasoline, diesel fuel, aviation fuel, fuel oil # 4 and solvents specified by the manufacturer. When used on flexible pipeline systems, the XLP may be used with systems containing gasoline, diesel fuel, aviation fuel and

solvents specified by the manufacturer. The detectors use a preset threshold and single test to determine whether a pipeline is leaking. The systems declare a leak if the output of the measurement system exceeds a threshold of 3 gallons per hour.

The systems may be used when trapped vapor is present in the pipeline during the test. Flow restrictors must be located at a depth such that pressure from lines will not adversely affect functioning of the system. The manufacturer recommends that the vertical elevation from the center line of the pump to the dispenser be no more than 5 feet for the XLP, and 11 feet for the DLD and XLD .

There is no waiting period between the last delivery of product to the tank or the last dispensing of product through the pipeline system and the start of data collection.

The total time for data collection for the automatic line detectors is approximately one to 15 minutes, depending on temperature.

#### FX1, FX2, FX1D, FX2D, FX1V, FX2V, FX1DV, FX2DV and Big Flo Line Leak Detector Systems

The FX series line leak detectors are mechanical devices that are permanently installed in pressurized line systems. The unit may be installed in a standard Red Jacket pump, downstream from the pump in a special adapter, or as a pilot valve for the Big Flo Leak Detector unit. When the pump is activated, product is metered into the line through a poppet valve. When the line pressure reaches a nominal value of 10-15 psi, the poppet valve opens and full flow into the line occurs. If the pressure does not reach 10-15 psi (i.e., a leak is present), the poppet does not open, and product flow in the line is restricted to approximately 3 gallons per minute. The FX models are designed to operate at lower flow rates than the Big Flo system.

The Big Flo leak detector is a diaphragm-operated valve which uses a pilot control valve to detect a leak. The pilot leak detector is mounted “piggy back” onto the Big Flo unit and controls the pressure on one side of the Big Flo’s control diaphragm. If the pilot detector detects a leak, it will close and put full pump pressure on the Big Flo’s control diaphragm. This will keep the control diaphragm closed and restrict the product flow. If the pilot valve is in the fully open position, which occurs when there is no leak greater than its threshold value, the pressure on the control diaphragm will be lower. This pump pressure will then lift the Big Flo’s poppet which allows the normal flow rate.

The FX1, FX2, FX1V and FX2V line leak detectors can be used with or without the Big Flo system, on rigid or flexible piping which has either single wall or double wall construction and which contains gasoline, diesel fuel, aviation fuel or some solvents. The FX1D, FX2D, FX1DV and FX2DV line leak detectors can be used with the Big Flo system, on single or double wall rigid piping which has a bulk modulus typically greater than 20,000 psi and which contains diesel fuel or some solvents. Rigid piping diameters can be from 1 to 6 inches, and flexible piping diameters can be up to 3 inches.

## TESTS AND RESULTS

The performance of the Red Jacket CPT pipeline monitoring system was determined using the EPA protocol for evaluation of pipeline leak detection systems. When used as an hourly line leak detector, this system is capable of detecting a 3 gallon per hour leak at 10 psi with a probability of false alarm ( $P_{FA}$ ) of 0 percent and probability of detection ( $P_D$ ) of 100 percent. When used for monthly monitoring, this system is capable of detecting a 0.2 gallon per hour leak at 20 psi with a  $P_{FA}$  of 0 percent and a  $P_D$  of 100 percent. When used as a line tightness test, the CPT system is capable of detecting a 0.1 gallon per hour leak at 45 psi with a  $P_{FA}$  of 0 percent and a  $P_D$  of 100 percent.

The performance of the DLD, XLD and XLP hourly pipeline monitoring systems was determined using the EPA protocol for evaluation of pipeline leak detection systems. When used as an automatic line leak detector, the systems are capable of detecting a 3 gallon per hour leak at 10 psi with a  $P_{FA}$  of 0 percent and  $P_D$  of 100 percent.

The FX1, FX2, FX1V, FX2V, FX1DV and FX2DV line leak detectors for hourly monitoring of both flexible and rigid lines were shown to have a probability of detecting a 3.0 gallon per hour leak at 10 psi of 100 percent.

The FX1D, FX2D, FX1DV and FX2DV line leak detectors for hourly monitoring of rigid lines was shown to have a probability of detecting a 3.0 gallon per hour leak at 10 psi of 100 percent.

The performance of the Liquid-Phase Product Detectors was determined using a test procedure developed following the EPA protocol for evaluation of liquid-phase, out-of-tank product detectors.

## LIMITATIONS OF APPROVAL

Procedures specified by the Marley Pump Company shall be used for the installation and maintenance of equipment and to conduct all tests.

Records of sampling, testing or monitoring shall be maintained in accord with **s. Comm 10.625 (2)**.

### CPT Line Leak Detection System

The CPT system may be used for hourly testing on rigid or flexible lines up to 172 gallons capacity, or 400 feet in length by 3 1/4 inches in diameter. This system can be used for monthly or annual testing on rigid or flexible lines up to 163 gallons capacity, or 350 feet in length by 3 3/8 inches in diameter.

There is no required waiting time between dispensing or product delivery and beginning the tests.

### XLP, DLD and XLD Line Leak Detectors

The XLP, DLD and XLD leak detection systems are approved for use in underground storage tank facilities on pipeline systems which are constructed of fiberglass or steel and which have a maximum volume of 55 gallons.

The XLP leak detector is also approved for use with Enviroflex pipe manufactured by Total Containment, and with other flexible pipeline systems that have a bulk modulus below 15,000 psi. The maximum volume of the flexible pipeline shall be 48.6 gallons.

### FX1, FX2, FX1V and FX2V, With or Without the Big Flo System

These systems do not require a specific waiting time after delivery or after dispensing, although a stabilization period of up to 45 minutes may be required when the temperature differences are very large.

The maximum line capacity for flexible piping is 50 gallons. This is equal to approximately 540 feet of 2-inch diameter Enviroflex line.

The maximum line capacity for rigid piping is 316 gallons. This is equal to approximately 700 feet of 3/8-inch diameter pipe.

### FX1D, FX2D, FX1DV and FX2DV, With or Without the Big Flo System

These systems do not require a specific waiting time after delivery or after dispensing, although a stabilization period of up to 45 minutes may be required when the temperature differences are very large.

The maximum line capacity for flexible piping is 50 gallons. This is equal to approximately 540 feet of 2-inch diameter Enviroflex line.

The maximum line capacity for rigid piping is 362 gallons. This is equal to approximately 784 feet of 3-inch line.

USE OF APPROVAL

This approval will be valid through December 31, 2004, unless manufacturing modifications are made to the product or a re-examination is deemed necessary by the Department. The Wisconsin Material Approval Number must be provided when plans that include this product are submitted for review.

DISCLAIMER

The Department is in no way endorsing or advertising these products. This approval addresses only the specified applications for the products and does not waive any code requirement unless specified herein.

Reviewed by: \_\_\_\_\_

Approval Date: \_\_\_\_\_ By: \_\_\_\_\_

Duane Hubeler, P.E.  
Code Consultant  
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