

**Evaluation of the Red Jacket
Fx1, Fx2, Fx1V and Fx2V
Line Leak Detection Systems
(Installed in the Big-Flo)
for Hourly Testing on
Bulk Pipelines Containing
Unleaded Gasoline**

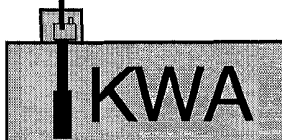
Addendum

**(to the March 15, 1994 Evaluation of the
Red Jacket Fx1D, Fx2D, Fx1DV and Fx2DV
Line Leak Detection Systems (Installed in
the Big-Flo) for Hourly Testing on Bulk
Pipelines Containing Unleaded Gasoline)**

PREPARED FOR:

**Marley Pump
a United Dominion Company**

**June 1, 1994
(Revised July 24, 1995)**



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**Addendum
(to the March 15, 1994 Evaluation of the
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Line Leak Detection Systems (Installed in
the Big-Flo) for Hourly Testing on Bulk
Pipelines Containing Unleaded Gasoline)**

**PREPARED FOR:
Marley Pump
a United Dominion Company
5800 Foxridge Drive
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**June 1, 1994
(Revised July 24, 1995)**

Preface

The data contained in this report was obtained from the Red Jacket Fx2, installed on the Big-Flo. This report is to be used in conjunction with the March 15, 1994 evaluation of the Red Jacket Fx1D, Fx2D, Fx1DV, and Fx2DV Line Leak Detection Systems (Installed in the Big-Flo) for Hourly Testing on Bulk Lines Containing Diesel Fuel. This report can be applied to the FX1, FX2, FX1V, and FX2V line leak detectors installed in the Big-Flo. The report contains additional test data that was collected on the same pipeline used in the March 15 evaluation. However, the additional testing was conducted using unleaded gasoline rather than diesel fuel. Testing was performed in accordance with the EPA Pipeline Leak Detection Test Protocol with the exception of the number of tests performed. All of the tests were conducted at the Leak Detection Test Center, which is operated by Ken Wilcox Associates, Inc. Questions regarding this report should be directed to Mr. Klaus Jarr, Marley Pump Company, at (913) 831-5700.

KEN WILCOX ASSOCIATES, INC.

H. Kendall Wilcox, President

June 1, 1994 (Revised July 24, 1995)

Note Regarding July 24th Revision:

Although the testing described in this report was obtained on the Red Jacket Fx2, the data can be applied to the Fx1, Fx2, Fx1V, and Fx2V. This conclusion is based on a review of the construction blueprints for each of the leak detectors. The critical components that determine the leak detection performance characteristics of all of the leak detectors are identical. The differences are in the presence or absence of vents or test ports located in the upper housing of the leak detector. These vents and ports have no effect on the performance of the equipment.

Introduction

This report is to be used in conjunction with the March 15, 1994 evaluation of the Red Jacket Fx1D, Fx2D, Fx1DV, and Fx2DV Line Leak Detection Systems (Installed in the Big-Flo) for Hourly Testing on Bulk Lines Containing Diesel Fuel. In the March 15 evaluation, the Fx1D, Fx2D, Fx1DV, and Fx2DV line leak detectors installed in the Big-Flo were certified to meet the requirements of the U.S. Environmental Protection Agency for Pipeline Leak Detection Systems. The system was certified with a probability of detection (P_D) of 100% and a probability of false alarm (P_{FA}) of 0% for Hourly Monitoring. The evaluation applied to pipelines containing diesel fuel with a volume up to 362 gallons, which is equivalent to 784 feet of 3 inch diameter pipe.

This report contains additional test data that was collected from the Fx2 installed in the Big-Flo. The results from this data can be applied to the Fx1, Fx2, Fx1V, and Fx2V systems. This data was collected on the same pipeline that was used for the March 15 evaluation. However, for the additional test data the pipeline contained unleaded gasoline instead of diesel fuel and the Fx2 was installed in the Big-Flo rather than the Fx2D. The Fx2 and the Fx2D are identical except that the Fx2D is the modified for diesel fuel. Testing was performed in accordance with the EPA Pipeline Leak Detection Test Protocol with the exception of the number of tests performed. The results of this abbreviated testing indicate that the Fx1, Fx2, Fx1V, and Fx2V when installed on the Big-Flo will successfully perform on pipelines containing unleaded gasoline up to 362 gallons, which is equivalent to 784 feet of 3 inch diameter line.

Test Conditions

The test conditions were identical to those described in the March 15 evaluation except that unleaded gasoline was the product rather than diesel fuel and the Fx2 was installed in the Big-Flo rather than the Fx2D. All of the tests were conducted on a line with a volume of 181 gallons, which is equivalent to 392 feet of 3 inch diameter line.

The additional testing that was conducted consisted of six tests in which the Fx2 was installed in the Big-Flo. The test conditions and results for these 6 tests are provided in Table 1. Testing was conducted at rates equivalent to 3 gal/h at 10 psi for Hourly Monitoring. Testing was conducted at the temperature extremes of ± 25 deg F and at neutral. The ± 25 deg F temperature differences are the extremes required for EPA certification. If a leak detector is successful at these temperature differences, it would also be expected to pass at less extreme temperature differences.

Test Results and Discussion

The performance parameters for the Fx1, Fx2, Fx1V, and Fx2V installed in the Big-Flo have been summarized in Table 2. The leak detector performed correctly in its determination of a leak or a tight pipeline in all of the additional tests. Therefore, the P_D was 100% and the P_{FA} was 0% for the six additional tests.

If the EPA protocol is used to calculate the performance parameters for this leak detector, the Fx1, Fx2, Fx1V, and Fx2V installed in the Big-Flo can be used on rigid pipelines up to 362 gal (twice the volume of that tested), which is equivalent to 784 ft of 3-in fiberglass pipeline with a P_D of 95% or greater and a P_{FA} of 5% or less.

Table 1. Test Data for the Fx1, Fx2, Fx1V, and Fx2V Installed in the Big-Flo

Test No.	Date Test Began	Duration of Circulation	Time between End of Circulation and Start of Data Collection for Test	Total Test Time	Product/Ground Temperature Difference	Induced Leak Rate	Measured Test Result
	(D-M-Y)	(h-min)	(h-min)	(h-min)	(deg F)	(gal/h)	(gal/h)
1	14/10/93	1 hr	38 min	38 min	-25.06	2.93	Leak
2	14/10/93	1 hr	44 min	44 min	-25.06	0	Tight
3	29/4/94	1 hr	1 min	1 min	0.80	0	Tight
4	29/4/94	1 hr	2 min	2 min	0.80	2.93	Leak
5	29/4/94	1 hr	10 min	10 min	25.21	0	Tight
6	29/4/94	1 hr	11 min	11 min	25.21	2.93	Leak

Table 2. Performance Parameters for the Fx1, Fx2, Fx1V, and Fx2V Line Leak Detectors Installed in the Big-Flo

Parameter	Value
Probability of False Alarm (PFA)	0%
Probability of Detection (PD)	100%
Maximum Line Size	362 gal (784 feet of 3 in diameter line)
Average Waiting Time After Delivery of Product	None
Average Time Between End of Circulation and Start if Data Collection for the Test	18 minutes
Average Test Time	2 minutes