FENNER ENHANCED VAPOR RECOVERY AND MONITORING SYSTEM.

Fenner Fluid Power UK has been manufacturing stage 11 vapor recovery pumps in Europe for over 7 years. Fenner manufacture 4 pump models.

G50 This pump is designed to run at 1750 rpm
It recovers the vapor from one nozzle.
10 US gpm, (45 lpm).

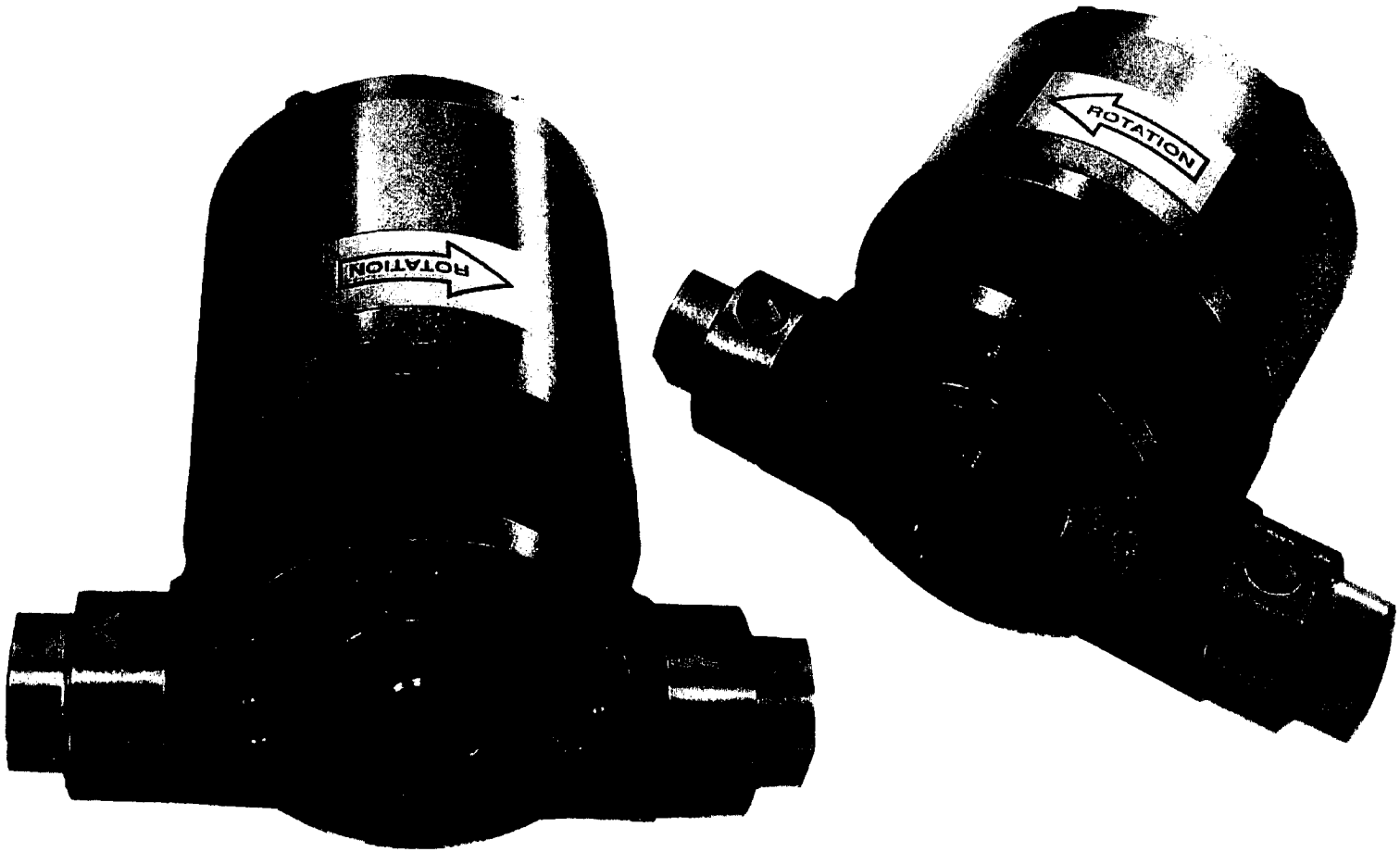
G56 This model runs at 1450 rpm and also has
The capacity to recover from one nozzle
10 US gpm, (45 lpm).

G100 Designed to run at 1750 rpm and recover the
Vapor from 2 nozzles simultaneously.
20 US gpm, (90 lpm).

G112 Runs at 1450 rpm and also recovers the
Vapor from 2 nozzles simultaneously.
20 US gpm, (90 lpm).

All the above pumps manufactured by Fenner met the safety requirements for the USA and have UL certification as well as PTB and BASEFFA the equivalent in Europe.

The pumps are designed to be either close coupled to an electric motor or pulley driven and supplied with or with out flame arrestors at both the inlet and outlet ports as required in Europe.



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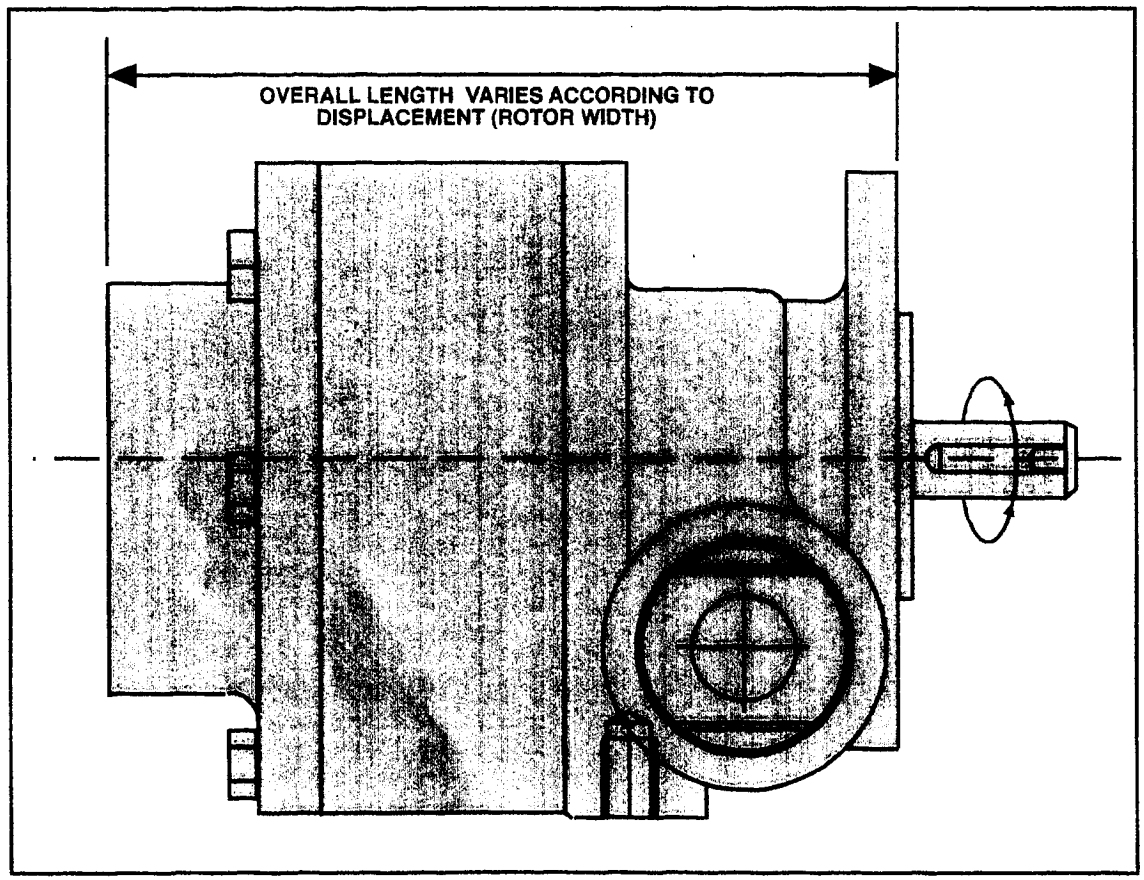
The following table shows the results take using a solenoid control valve in Fenners R&D department. 30 test were carried out at 5, 7.5, and 10 US gpm. Each test involved dispensing between 10 and 15 gallons. The final average over the 90 results was An astonishing 100.28%.

TYPICAL GENERAL ARRANGEMENT DRAWING FOR MADAN G56/G50/G100/G112 PUMPS



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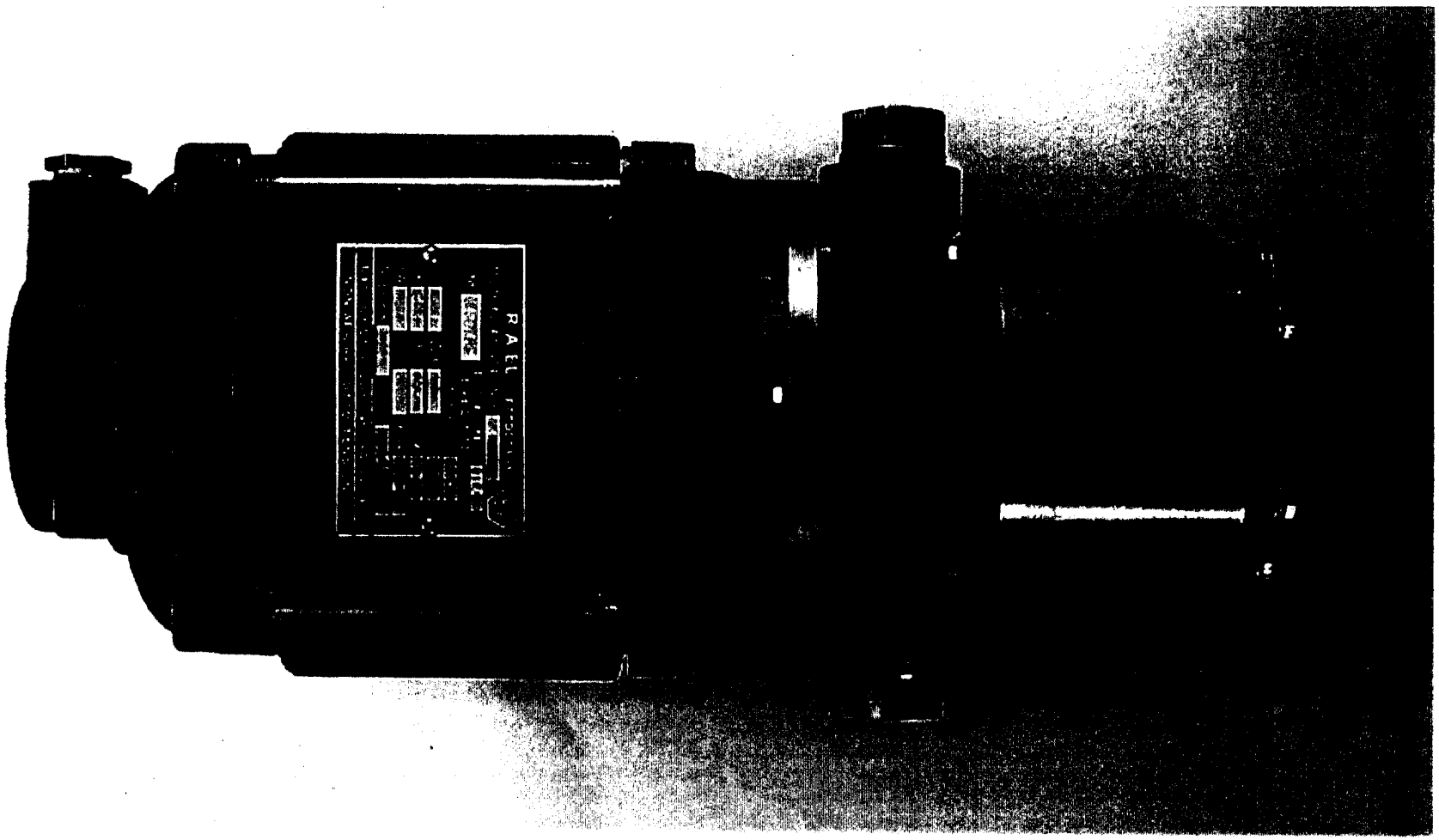

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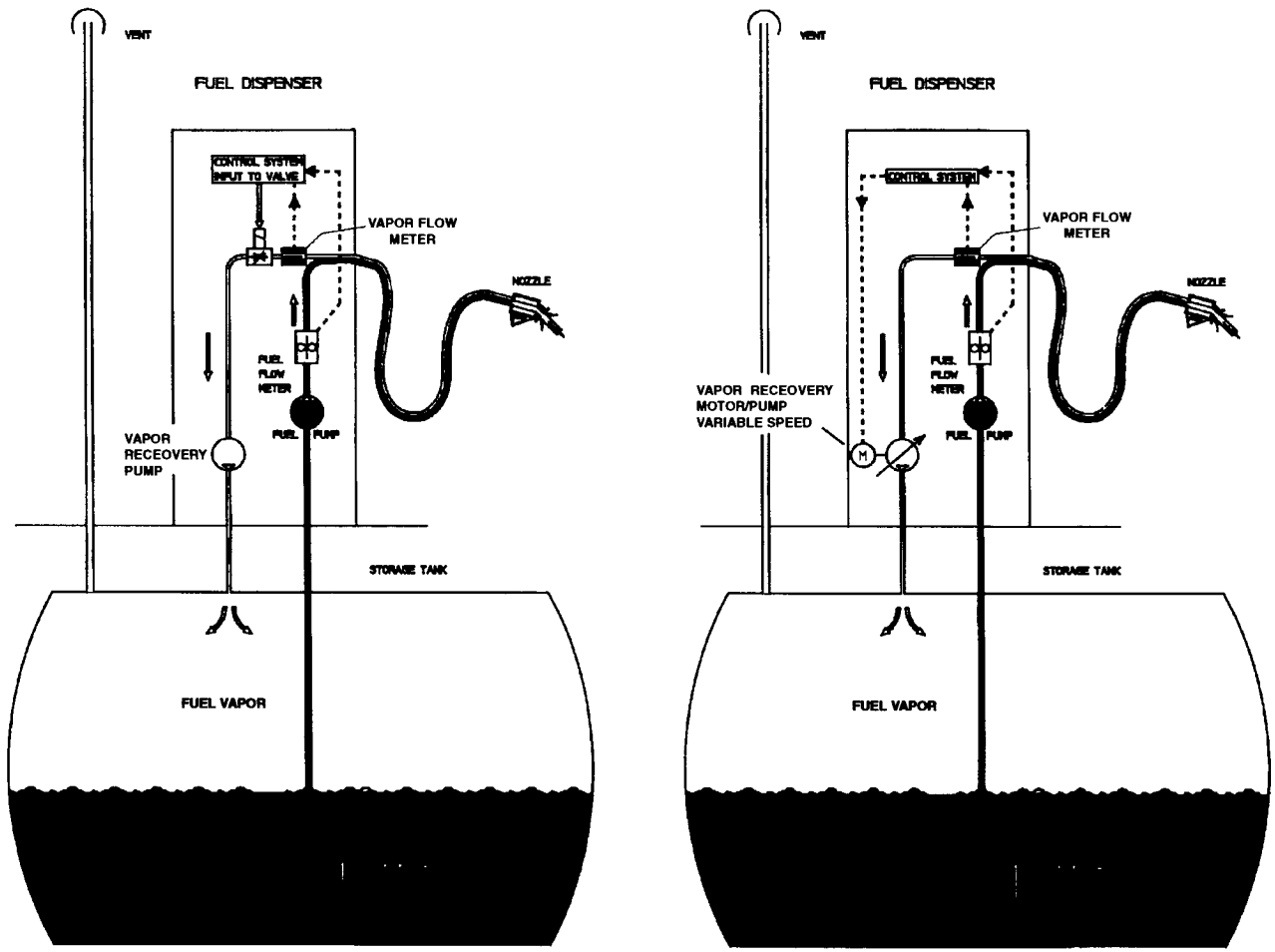
Fenner Fluid Power have for 4 years been developing a control system which would not only maintain the recovery rate very closely to the rate of fuel being dispensed but also monitor and indicate if it is not working within the local legislation.

IT HAS BEEN GENERALLY ACCEPTED IN EUROPE THAT A CLOSED LOOP FEED BACK SYSTEM IS THE BEST WAY TO CONTROL AND MAINTAIN CONSISTANT RESULTS.

THE PROBLEM HAS BEEN TO OBTAIN A COST EFFECTIVE FLOW METER, WHICH HAS THE CAPACITY OF 10 US gpm, (45 lpm). HAVE A VERY FAST RESPONSE TO CHANGE IN FLOWS, BE UNAFFECTED IF LIQUID WAS TO ENTER THE METER, AND MEET USA AND EU CERTIFICATION.

The closed loop system involves taking a signal from the fuel dispensed, a signal from a vapor flow meter, comparing the two outputs and adjusting the solenoid operated restrictor or variable speed motor to ensure these to flow rates are the same.

FEED BACK SYSTEM ON A MONO PUMP



ONE PUMP (G56 OR G50) PER NOZZLE

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TEST RESULTS ON SINGLE HOSE DISPENSER

LATCH 3 5 US GPM	LATCH 3 7.5 US GPM	LATCH 3 10 US GPM
101.2	100.3	101.3
100.5	101.1	100.4
99.5	99.4	99.6
99.0	101.0	100.1
98.4	100.3	100.4
101.1	101.1	101.5
96.4	101.0	100.6
103.7	99.9	99.3
100.5	99.0	100.3
99.1	99.4	100.1
97.6	99.9	101.4
102.2	99.4	100.4
105.9	99.4	99.8
98.4	99.5	99.8
101.0	98.9	99.9
	AVERAGE RESULTS	
100.03	99.96	100.33

FINAL AVERAGE OVER 90 RESULTS = 100.28%

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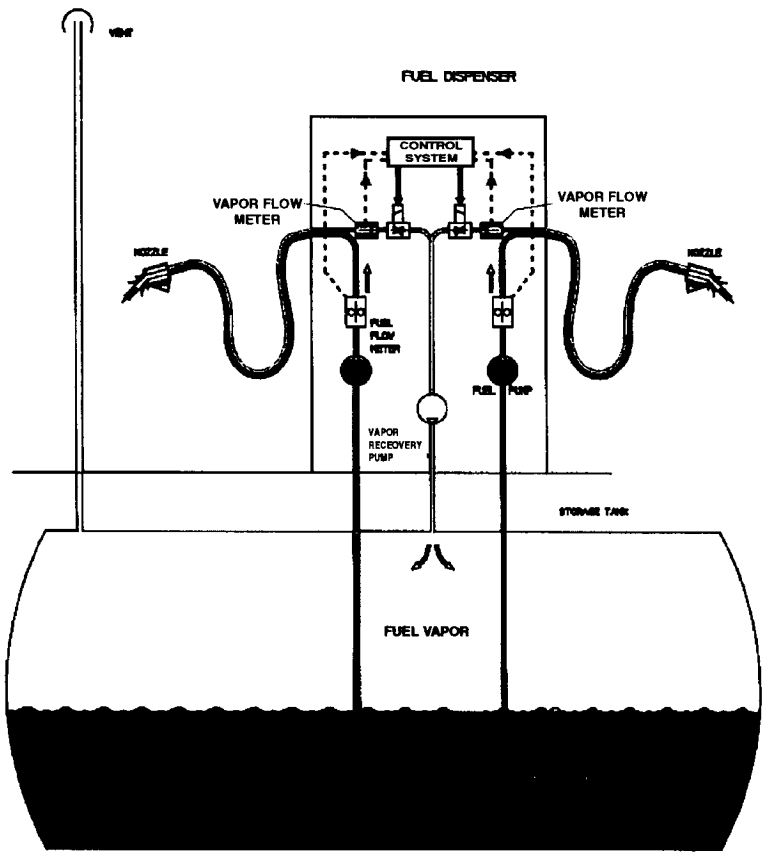
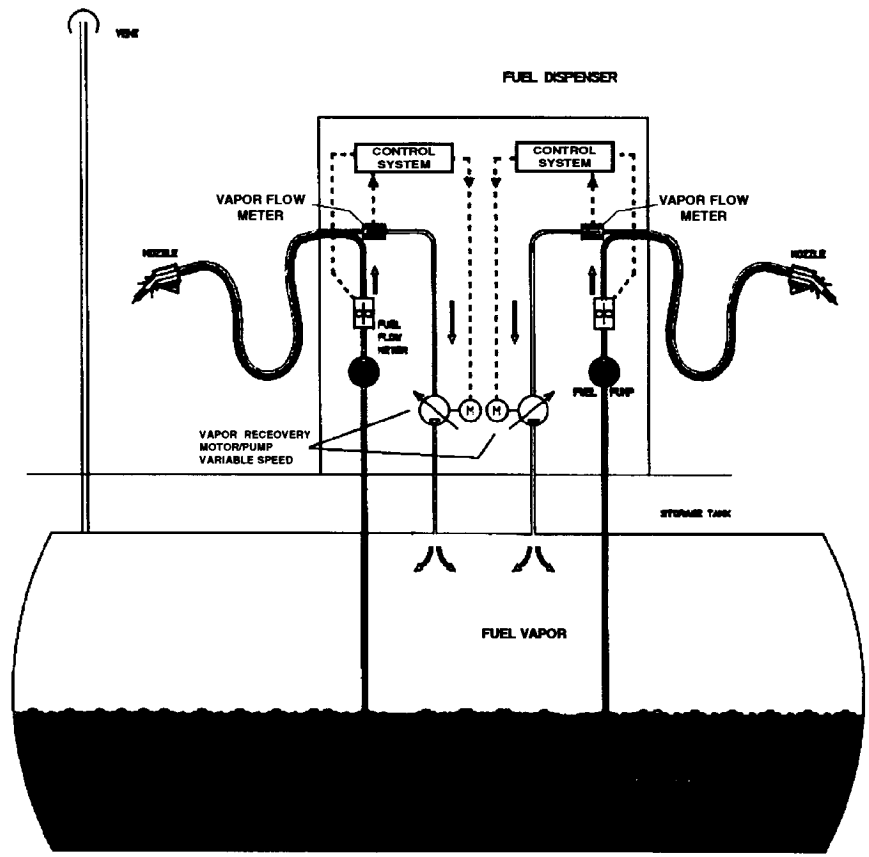
Obviously adding a flow meter into the current system would involve considerable additional Expense to the dispenser manufacturer. For the system to be cost effective it was important to carry out tests using only one pump in an MPD. The difference in the cost of one large pump to two smaller pumps will go some way towards of setting the cost of the flow meters. Using one pump in an MPD will only work using a solenoid control valve.

FEED BACK SYSTEM ON AN M.P.D.



ONE PUMP (G112 OR G100)



TWO PUMPS (G56 OR G50)SIZE

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The following table shows the results taken using one pump. The first results were with equal flows on both sides (10 gpm.) Side A was started first and side B approximately 10 second later. Each side dispensed between 10 and 15 gallons.

The tests were then repeated with side A flow rate of 10 gpm and side B set at 7.5 gpm. In this test side B was started first and between 10 and 15 gallons dispensed.

The third set of results was as the first but side A was set at 10 gpm and side B at 5 gpm.

The average fuel to vapor ratio after 180 results was 100.04%.

TEST RESULTS ON DOUBLE SIDED OPERATION (SIDE A & B TOGETHER)

SIDE A 10 US GPM LATCH 3	SIDE B 10 US GPM LATCH 3	SIDE A 10 US GPM LATCH 3	SIDE B 7.5 US GPM LATCH 2	SIDE A 10 US GPM LATCH 3	SIDE B 5 US GPM LATCH 1
99.8	99.6	100.2	100.0	101.3	96.8
101.1	99.8	101.8	97.5	99.6	102.4
100.1	100.5	99.7	99.8	99.0	97.2
99.5	99.2	99.0	99.4	99.4	98.5
99.5	100.0	100.1	99.4	100.9	99.5
100.1	99.2	98.6	99.9	101.3	99.5
100.1	102.5	101.3	101.9	99.8	100.5
101.9	99.3	99.9	100.6	99.6	98.5
100.5	99.8	99.5	101.2	99.8	97.6
100.3	98.3	99.5	98.8	101.0	99.7
99.7	102.5	97.9	99.5	99.1	103.5
100.9	102.4	99.1	99.0	100.3	99.2
100.4	100.0	99.7	101.2	99.1	101.6
98.4	102.4	99.3	102.2	100.2	100.8
99.7	99.1	101.6	99.3	99.4	99.9
		AVERAGE RESULTS			
100.13	100.31	99.81	99.98	99.99	99.81

OVERALL RESULTS OVER 180 RESULTS = 100.04%

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COMPONENT LAYOUT IN AN MPD

The transducer box measures the pressure drop across the flow meter and converts it to an electrical signal. This signal is then sent via a zenner barrier to the electrical control circuit.

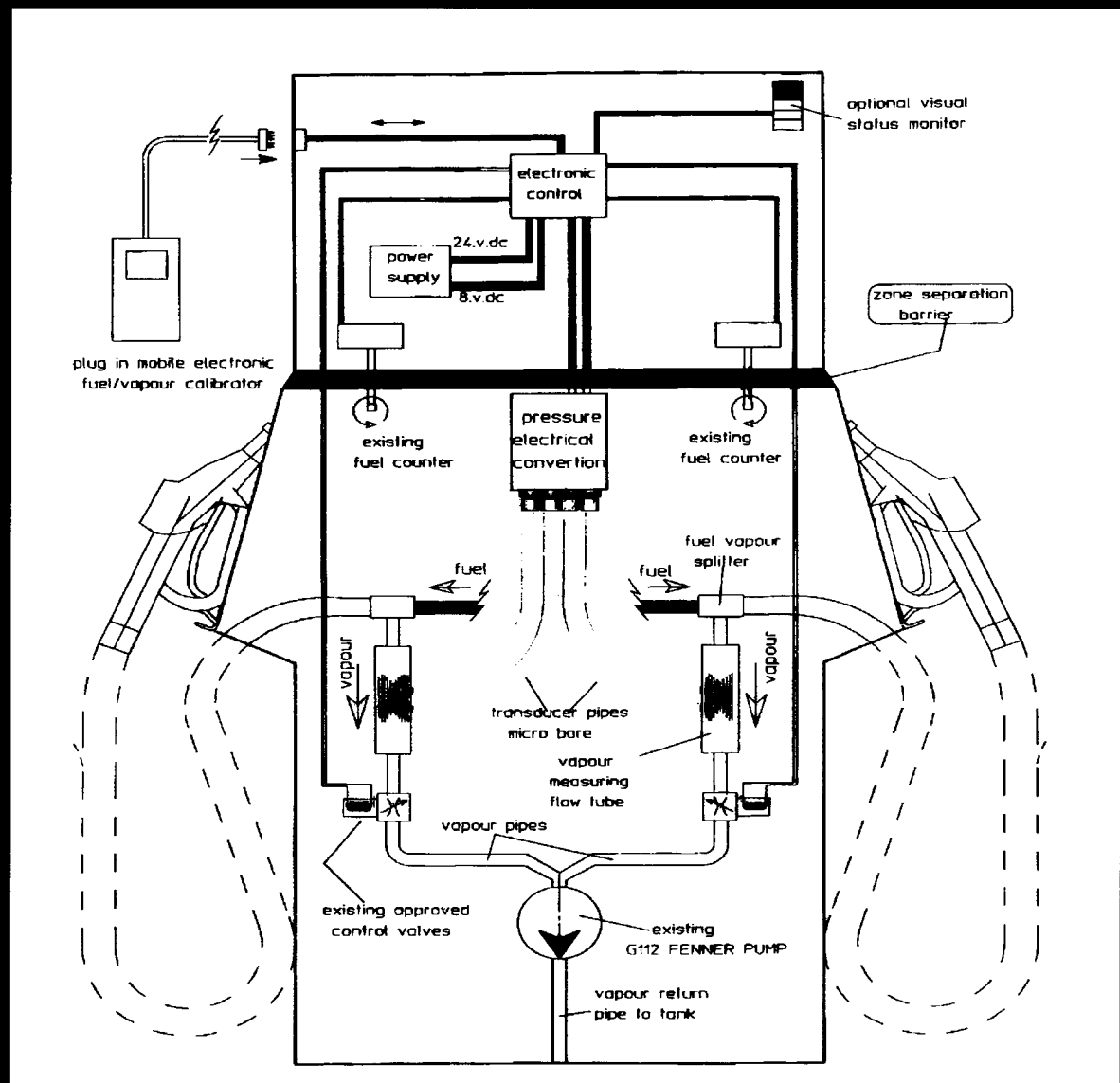
The control box also receives pulses from the fuel counter and compares them with those from the vapor. The resultant A/L signal is sent to the solenoid valve, which is adjusted some, twenty times a second to give the system accuracy.

MONITORING A/L

Having received these two signals the electronic control circuit can then be used as a monitoring system. Fenner in there R&D have coupled a dispenser with this system to a computer and have been able to record the A/L ratio every three second.

The monitoring system can be as sophisticated as recovering all the vapor recovery data or as simple as a green light to say the system is not only working but is working with in the local legislation. And a red light to say it is not.

FEED BACK AND MOITORING SYSTEM ON AN M.P.D



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Main

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105
% RECOVERY

%SIDE1

95

5

54.99

255

SAMPLING TIME

105
% RECOVERY

%SIDE2

95

5

54.99

255

SAMPLING TIME

ady

PLANNED MAINTAINANCE

As well as monitoring the A/L ratio the system enables planned maintenance of the vapor recovery system. A simple 5 LED indicator could show the percentage of vapor recovered.
The first light with 1 would indicate that the system is recovering with in 1% of legislation and the second light 2 indicates that the system is with in 2% of legislation. If for example the first light was on for the first 3 months of operation and the second light was on for the second three months then when the forth light comes on you have three months to have the service engineer look at the vapor recovery system before it goes out side of legislation. If a drive belt, fuse or coupling was to break then the system would give an immediate indication to call an engineer.

How sophisticated or how simple the system is up to the dispenser manufacturer. The electronic control box gives an A/L ratio. How or if this signal is used is up to the end user.