Dr. GLORIA HETTIGE

Industrial Microbiologist

c/- Carina Chemical Laboratories Ltd
P.O Box 30-366, Gracefield Road
Lower Hutt, Wellington

Telephone: (04) 662-753, 784-346

REPORT NUMBER: GH/4/90/:4

DE-BUG TRIAL 11 - MICROBIOLOGICAL TESTING OF DIESEL FUEL SUBJECTED TO THE 'DE-BUG' UNIT IN A KERBSIDE PUMP.

17 April 1990

1. SUMMARY

This trial clearly demonstrates the effectiveness of the 'De-Bug' unit to reduce microbiological contamination in a kerbside pump.

The test systems included the magnetized and an unmagnetized control. Naturally contaminated diesel fuel was pumped through each system. The duration of the trial was only half a day, and samples removed from the system and tested for levels of fungal and bacterial contamination.

The microbiological results indicated that fuel subjected to the magnetized unit had significantly lower fungal and bacterial counts than those treated in the control unit.

2. INTRODUCTION

This trial was undertaken for Shell Oil NZ Ltd. It was conducted as a follow up to the one described in the report no.GH/2/90:3. As recommended in the report, a naturally contaminated bulk fuel sample was tested and designed to simulate a normal kerbside pump operation in a service station situation.

3. MATERIALS AND EQUIPMENT

3.1 Test Systems

Two identical test systems were constructed as shown in Figure 1. System # 1 was a conventional De-Bug unit containing fully magnetized discs while system # 2 was identical in design but contained unmagnetized discs. All the material of construction e.g. pipelines used in the test system was identical to those encountered in a normal service station kerbside pump. The fuel flow rates through the system were adjusted to approximately 67 L/min. The trial was conducted at the premises of Shell Oil NZ Ltd, Seaview.

3.2 Fuel

Six diesel fuel samples were collected from different kerbside pumps around Wellington region. Microbiological analysis was done on each of the sample. The results indicated the sample from Downers Ltd had maximum level of microbiological contamination (1000cfu/L). Thus bulk fuel samples were drawn from Downers Ltd for this trial.

4. EXPERIMENTAL METHODS

4.1 Test System Running and Sampling

A total of three drums, each containing 200 litres of contaminated fuel was held at room temperature (25 degree C).Two drums (D1 and D2) were used for the magnetized De-Bug unit and D3 for the unmagnetized De-Bug unit. Fuel from each drum was directly pumped through the De-Bug units into clean drum.It took 3 minutes to pump 200 litres of contaminated fuel through the De-Bug units into clean drum. The test systems were run sequentially. This was done to simulate the pumping of fuel into a truck at a service station. Fuel samples were removed from the test systems before(B) and after(A) 0 litres, 80 litres and 180 litres of fuel had passed through the De-Bug unit, refer Figure 1. Samples were collected aseptically in sterile glass bottles, 1000 ml being taken for microbiological testing.

4.2 Microbiological Testing

4.2.1 Fungi

Five 100 ml volumes of fuel were vacuum filtered aseptically on sterile membrane filters. The filters were then placed in sterile plastic petri-dishes and sterile molten malt-extract agar poured over them. The agar was allowed to set and the dishes incubated at 25 degree C for 5 days. The colonies were then counted and the results recorded as colony-forming units(cfu) per litre of fuel filtered.

4.2.2 Bacteria

Essentially the same method was used as in 4.2.1. Incubation was at 25 degree C for two days.

5. RESULTS

5.1 Microbiological

All microbiological counts are listed in Table 1. It should be remembered that the maximum countable level is 1000 cfu/litre, when the filter is completely covered with colony forming units. Thus, '1000 cfu' could in fact be significantly higher, eg 10,000 cfus' to 1,000,000 cfus' or more.

5.1.1 Fungi

Results from Table 1 are shown in Figure 2A.

5.1.2 Bacteria

Results from Table 1 are shown in Figure 2B.

6. CONCLUSION AND DISCUSSION

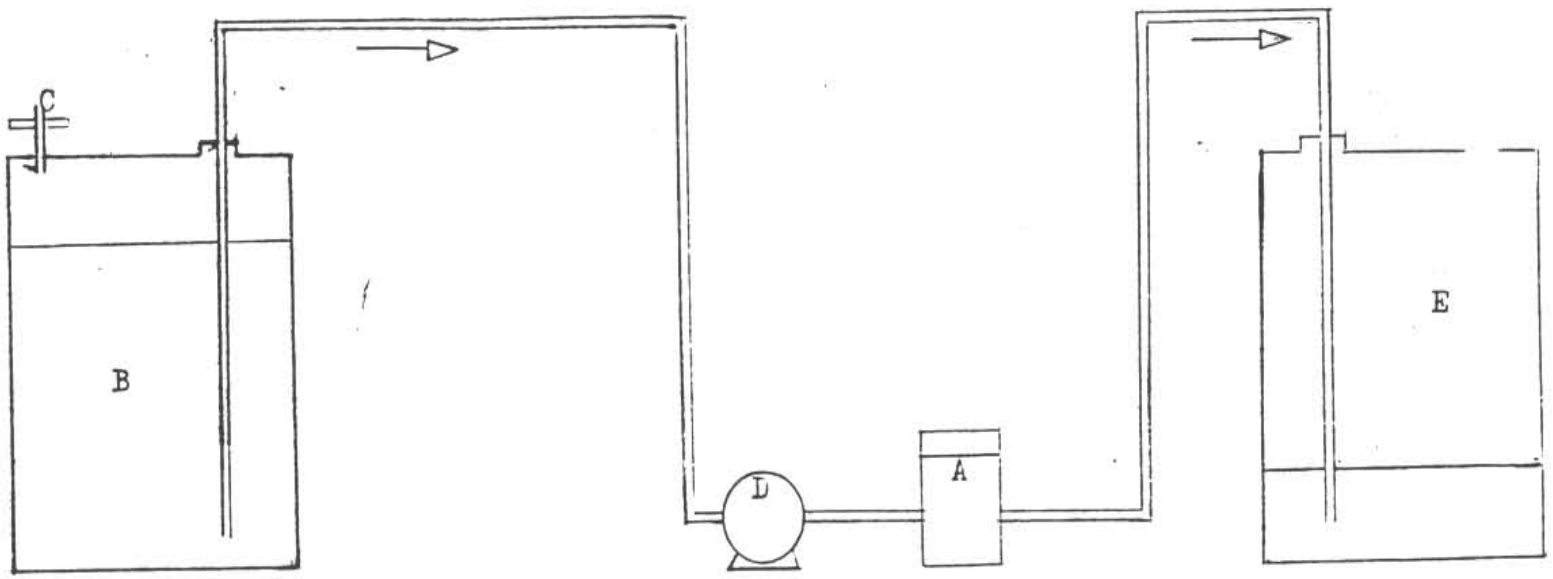
6.1 Microbiological Test Results

Once again it has become evident from Table 1, Figures 2A and 2B that fungi and bacteria cfus' of drums D1 and D2 were significantly reduced by the De-Bug unit containing the magnetic discs. In the case of the control unit, no reduction of fungi was observed.

It is evident from the results that the De-Bug device is capable of reducing the fuel degrading organisms even at high flow rates, as encountered in a service station situation. It controlled the reoccurence of maximum contamination in the fuel system.

Figure 1.

DEBUG TRIAL FOR KERBSIDE PUMP



A: DEBUG UNIT

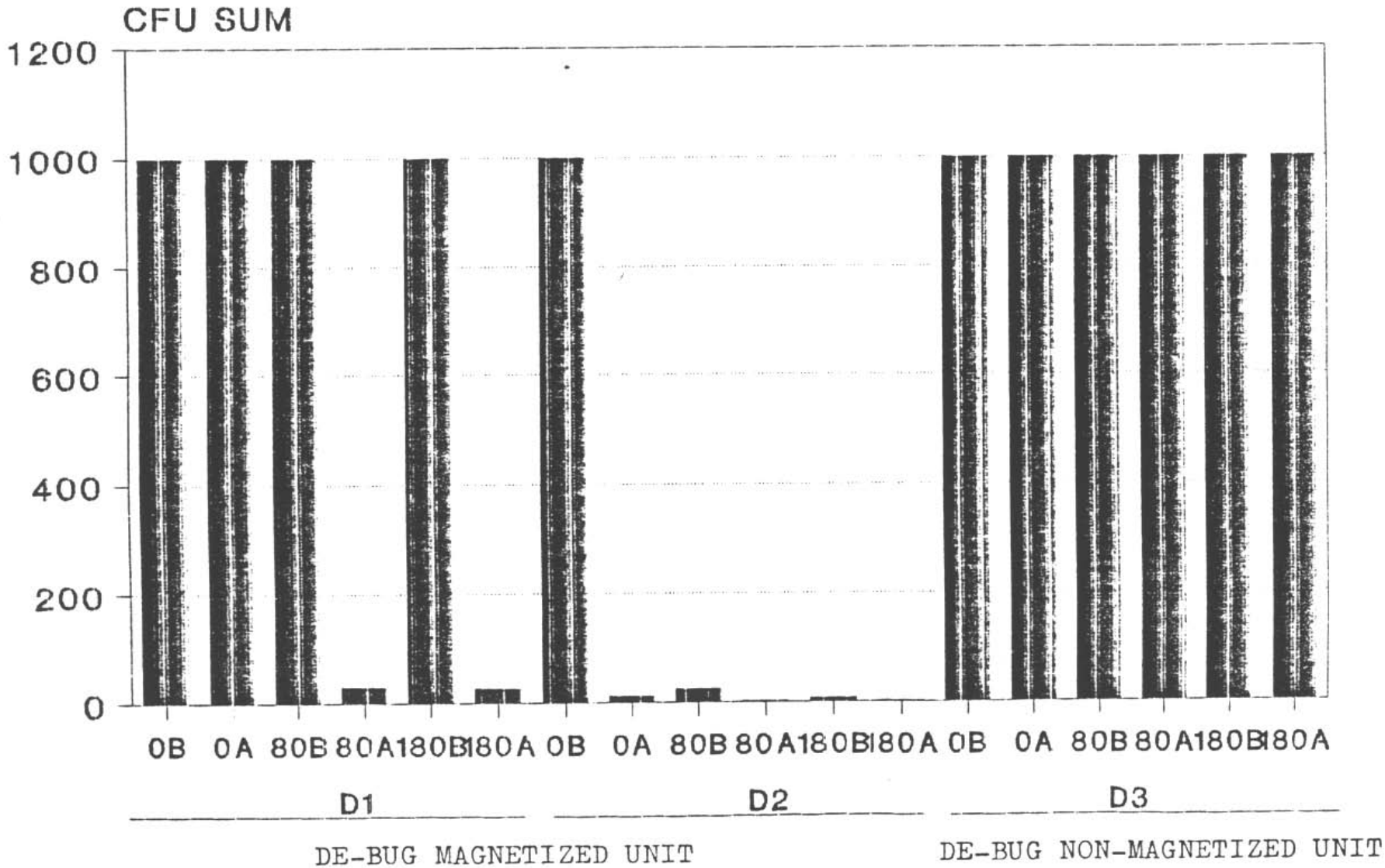
B: 200L CONTAMINATED FUEL RESEVOIR

C: VENT FILTER

D: CIRCULATION PUMP - KERBSIDE PUMP

E: FUEL COLLECTING DRUM

MICROBIOLOGICAL TESTING OF DIESEL FUEL
SUBJECTED TO THE DE-BUG UNIT
FIGURE 2A - TEST RUN FUNGI



MICROBIOLOGICAL TESTING OF DIESEL FUEL
SUBJECTED TO THE DE-BUG UNIT
FIGURE 2B - TEST RUN BACTERIA