

TRANSPORT CANADA GOVERNMENT TEST RESULTS

NOTE THIS REPORT IS A FOLLOW UP ON THE ORIGINAL TESTS BEGUN  
IN AUGUST OF 1979.

DATE: FEBRUARY 5, 1981

CONFIDENTIAL REPORT

MICROLON METAL TREATMENT TEST EVALUATION - FOLLOW UP REPORT

Authorized by: Mr. R. C. Burkhill  
Office of the Chief  
Mobile Support & Stationary Equipment Division  
Airport Facilities Branch  
Transport Canada Air  
Ottawa, Ontario

Conducted &  
compiled by: Mr. Sid Harris  
Supervisor of Mobile Equipment  
Vancouver International Airport  
Richmond, B. C.

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INTRODUCTION:

This report is a follow up to the original begun in August of 1979. The purpose of this subsequent data is to demonstrate the long lasting qualities of Microlon Metal Treatment.

Eleven of Transport Canadas' units, in four cities, were treated in mid 1979 and a complete report was compiled in May of 1980; ten months after the initial treatments were administered. This report is indicative of the effects of a Microlon treatment 18 months later.

This test data was compiled by Mr. Sid Harris at the Vancouver facility on a variety of engines. Selected for follow up were a small and large gas engine and a small and large diesel engine.

The two most important benefits of a Microlon treatment are, first and foremost, the reduction of wear and secondly the reduction of fuel consumption. These were the two areas tested for this follow up report.

TEST PROCEDURES:

For easy reference purposes, all vehicles chosen for follow up were coded under the original Transport Canada vehicle identity numbers as follows:

Green 3 (53-6020)	Ford $\frac{1}{2}$ ton pick up 360 cu" V-8 gas engine
Blue 30 (61-7432)	Jacobsen F-20 Ford 192 cu" 4 cyl diesel engine
Blue 8 (55-7532)	I.H.C. Dump truck 3208 8 cyl Cat diesel
Blue 19 (57-7532)	Rear - Ford 172 cu" 4 cyl gas engine

To illustrate the wear reduction, a chart has been drawn up which compares the before treatment analysis with the latest wear analysis.

Fuel consumption was compared with the six month average before treatment and the average consumption to date after treatment.

It is significant to note that on unit Green 3, the oil sent in for wear analysis had 18,053 miles on it. This is more than 3 times the normal life span. This also indicates that the metal content in the oil would be 3 times the content if the oil had been changed as usual. Even at that, the wear rate showed much lower than before treatment.

The fuel consumption on Green 3 could not be calculated as some months ago the unit was converted to propane. This may also have assisted the continued wear reduction.

The front engine on unit Blue 19, which was reported to be troubled in our last report, was replaced with a new diesel; thus making a fuel comparison meaningless.

FUEL CONSUMPTION:

Unit	Before Microlon	After Microlon	% Improvement
Blue 30 (61-7432) Jacobsen F-20 Ford 192 cu" 4 cyl diesel	1.26 gal/ hr	.97 gal/hr	23.0%
Blue 8 (55-7532) I.H.C. dump truck 3208 8 cyl Cat diesel	5.9 mpg	6.11 mpg	3.6%

Blue 30 burned 2,321 litres (510.7 gal) from 557 hrs to 1,085 hrs. A total lapsed time of 528 hours.

Blue 8 burned 4,853 litres (1,067.7 gal) from 15,009 miles to 21,529 miles. A total of 6,520 miles.

WEAR RATES:

<u>Unit</u>	<u>Stage</u>	<u>Iron</u>	<u>Chromium</u>	<u>Copper</u>	<u>Aluminum</u>	<u>Tin</u>	<u>Total</u>	<u>% Wear</u>
Green 3	Before After	217 51	13 4	36 51	33 7	34 14	333 127	162.2
Blue 30	Before After	51 52	8 2	3 1	6 3	8 2	76 60	26.7
Blue 8	Before After	36 11	1 1	1 1	2 1	6 1	46 15	206.7
Blue 19 Rear	Before After	230 153	15 7	24 4	84 12	14 8	367 184	99.5

Mileage on units since treatment:

Green 3	30,704 miles
Blue 30	528 hours
Blue 8	6,520 miles
Blue 19	5,981 miles

# Bethel

## GASOLINE FILLED EQUIPMENT

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PHONE: 435-4132

Green 3

Expressed in P  
per Million

UNIT NUMBER	S.A.E. USED	S.A.E. NOW	% FUEL DIL.	WATER	FUEL SOOT	GROSS METAL ABRAS.	GROSS METAL INDEX	ACID INDEX	IRON	CHRO-MIUM	COPPER	ALUM-INUM	SILI-CONE	TIN	SODIUM	MAGNE-SIUM	SILVER	NICKEL
16-A GREEN 3	20	20	1.0	X	X	X	X	3	0	217	13	25	31	22	24	114	6	1

SAMPLE DRAWN: JULY 25/79

ANALYSIS MADE: AUG 2/79  
 ICRULON FOR MOT; The wear rates are well above normal for Iron, Aluminum, and Tin with the Copper level also rising. The wear is to rings and cylinder walls, pistons, and piston skirts with a rising level of bearing metal loss which is most likely to be secondary wear. The Sodium level is also well above normal and this usually results from contamination by either antifreeze solution or a cleaning compound although we find no evidence of either here. The oil stability is still good and the only reason for recommending oil change at this time is because of the content of abrasives. Early attention to the air intake system is also warranted.

TOTAL MILES/HRS. ON UNIT:

Expressed in Parts Per Million

UNIT NUMBER	S.A.E. USED	S.A.E. NOW	% FUEL DIL.	WATER	FUEL SOOT	GROSS METAL ABRAS.	GROSS METAL INDEX	ACID INDEX	IRON	CHRO-MIUM	COPPER	ALUM-INUM	SILI-CONE	TIN	SODIUM	MAGNE-SIUM	SILVER	NICKEL

SAMPLE DRAWN:

ANALYSIS MADE:

ON OIL:

TOTAL MILES/HRS. ON UNIT:

Expressed in Parts Per Million

UNIT NUMBER	S.A.E. USED	S.A.E. NOW	% FUEL DIL.	WATER	FUEL SOOT	GROSS METAL ABRAS.	GROSS METAL INDEX	ACID INDEX	IRON	CHRO-MIUM	COPPER	ALUM-INUM	SILI-CONE	TIN	SODIUM	MAGNE-SIUM	SILVER	NICKEL

SAMPLE DRAWN:

ANALYSIS MADE:

ON OIL:

TOTAL MILES/HRS. ON UNIT:



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**3D EQUIPMENT  
Line Clearance**

**GREEN 3**

*n Parts Per Mill.*

UNIT NUMBER	S.A.E. USED	S.A.E. NOW	% FUEL OIL.	WATER	FUEL SOOT	GROSS METAL ABRAS.	GROSS METAL ABRAS.	SLUDGE INDEX	ACID INDEX	IRON	CHRO-MIUM	COPPER	ALUM-INUM	SILI-CON	TIN	SOD-IUM	MAGNE-SIUM	SILVER	NICKEL
<b>BEFORE</b>	145	20	1.0	X	X	X	X												
16-16 GREEN 3	20									217	13	26	31	34	311	111	6	1	1

SAMPLE DRAWN: JULY 25/79

TOTAL MILES/HRS. ON UNIT:

ANALYSIS MADE: AUG 2/79  
MICROLON FOR MOTOR; The wear rates are well above normal for iron, aluminum, and tin with the copper level also rising. The wear is to secondary irons and cylinder walls, pistons, and piston skirts with a rising level of bearing metal loss which is most likely to be secondary wear. The sodium level is also well above normal and this usually results from contamination by either anti-freeze solution or a cleaning compound although we find no evidence of either here. The oil stability is still good and the only reason for percentage oil change at this time is because of the content of abrasives. Early attention to the air intake system is also recommended.

UNIT NUMBER	S.A.E. USED	S.A.E. NOW	% FUEL OIL.	WATER	FUEL SOOT	GROSS METAL ABRAS.	GROSS METAL ABRAS.	SLUDGE INDEX	ACID INDEX	IRON	CHRO-MIUM	COPPER	ALUM-INUM	SILI-CON	TIN	SOD-IUM	MAGNE-SIUM	SILVER	NICKEL
<b>AFTER</b>	146	20	1.5	X	X	X	X			1	60	7	12	10	8	8	32	2	1
GREEN-#3	1																	3	

SAMPLE DRAWN: Aug. 22/79 ANALYSIS MADE: Aug. 30/79

TOTAL MILES/HRS. ON UNIT:

MICROLON FOR TRANSPORT CANADA: AIRPORT: These metal wear rates are all low to normal. The silicon reading indicates good air cleaner efficiency. Other items on the engine show normal. Oil viscosity is normal for SAE 20 oil. The sludge volume is 0.2% indicating filter efficiency is good. This oil is suitable for continued use.

NOV 20 1981

**ENGINE OIL ANALYSIS**

*Vancouver Int. 1105  
EXPRESSED IN PARTS PER MI*

Y2784 0748

UNIT NUMBER	S.A.E. USED	S.A.E. NOW	% FUEL OIL.	WATER	FUEL SOOT	GROSS METAL ABRAS.	GROSS METAL ABRAS.	SLUDGE INDEX	ACID INDEX	IRON	CHRO-MIUM	COPPER	LEAD	ALUM-INUM	SILI-CON	TIN	SODIUM	MAGNE-SIUM	SILVER
<b>Green 3</b>	20	40	102	IPO	X	X	X	0.1	0.2	MEG.	30	4	61*	80*	10	7	10	15	120+
<b>After 2020</b>	20																		1

SAMPLE DRAWN: OCT. 20/80 ANALYSIS MADE: NOV. 14/80

TOTAL MILES/HRS. ON UNIT 13505 M ON OIL: 13505 M

TRANSPORT CANADA; AIRPORT; Copper and lead wear is well above normal but cause is not evident in this data. Other wear rates normal. The silicon reading indicates good air cleaner efficiency. Other items on the engine show normal. Oil viscosity shows a small increase which is not of concern. The sludge volume is 0.1% indicating filter efficiency is good. This oil is suitable for at least another 1000 miles.

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DIESEL FUELED PMENT Blue 70  
10

Expressed in Parts Per Million

BEFORE Microlon																
UNIT NUMBER	SAE USED	SAE NOW	% FUEL OIL	WATER	FUEL SOOT	GROSS METAL ABRAS.	SLUDGE INDEX	ACID INDEX	IRON CHRO-MIUM	COPPER LEAD ALUM-INUM	SILI-CON	TIN	SODIUM	MAGNE-SIUM	SILVER	NICKEL
20(A)	30	182	20	5.5	X	X	TR	0.5	51	8	3	i	6	5	2	1

SAMPLE DRAWN AUG 2/79

ANALYSIS MADE: AUG. 13/79  
MICROLON FOR MOT AIRPORT; These metal wear rates are all low to normal. The wear rate for Iron should not go higher. The Silicon reading indicates good air cleaner efficiency. The fuel dilution level is above normal which warrants attention to the fuel injection system and has thinned the oil; other items on the engine show normal. The sludge volume is 0.5% indicating filter efficiency is good. Charge oil and check fuel injection system.

Expressed in Parts Per Million

BEFORE Microlon																
UNIT NUMBER	SAE USED	SAE NOW	% FUEL OIL	WATER	FUEL SOOT	GROSS METAL ABRAS.	SLUDGE INDEX	ACID INDEX	IRON CHRO-MIUM	COPPER LEAD ALUM-INUM	SILI-CON	TIN	SODIUM	MAGNE-SIUM	SILVER	NICKEL

SAMPLE DRAWN:

ANALYSIS MADE:

ON OIL:

Expressed in Parts Per Million

BEFORE Microlon																
UNIT NUMBER	SAE USED	SAE NOW	% FUEL OIL	WATER	FUEL SOOT	GROSS METAL ABRAS.	SLUDGE INDEX	ACID INDEX	IRON CHRO-MIUM	COPPER LEAD ALUM-INUM	SILI-CON	TIN	SODIUM	MAGNE-SIUM	SILVER	NICKEL

SAMPLE DRAWN:

ANALYSIS MADE:

ON OIL:

TOTAL MILES/HRS. ON UNIT:

ON OIL:

44778  
Bluet 30

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MR. JOHN CANADA  
GENERAL MANAGER

TRANSPORT CANADA  
VICTORIA INTERNATIONAL AIRPORT  
VICTORIA, B.C.

**ENGINE OIL ANALYSIS**

Y401H

EXPRESSED IN PARTS PER MILLION

ITEM	SAE USED	SAE NOW	% FUEL OIL	WATER	FUEL SOOT	GROSS METAL	SLUDGE INDEX	ACID INDEX	IRON	CHRO-MIUM	COPPER	LEAD	ALUM-INUM	SILI-CON	TIN	SODIUM	MAGNE-SIUM	SILVER	NICKEL
1	10	10.4	X	X	TR	X	0.3	3	NEXI.	52.4	2	1	1	3	1	2	1	120+	1
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
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19																			
20																			

TEST DRAWN: DEC. 15/80

ANALYSIS MADE: DEC. 29/80

TOTAL MILES/HRS ON UNIT 901 H      ON OIL: 208 H

MR. JOHN CANADA; PHOED. The fuel dilution level is above normal which warrants attention. The fuel injection system and has mixed 4% oil; other items on the engine show normal. This is causing high Iron from liners. Other wear rates normal. The iron reading indicates good air cleaner efficiency. The sludge volume is 0.3%, indicating filter efficiency is good. Change oil time of attention to the fuel injection system.

REQUIR. Y ATTENTION

X:NIL      Y:F.C.M.A.W:

P.O. W      TBO X-2411  
UNIT: 61-7432

*DeForte*  
DIESEL FUELED EQUIPMENT

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*Brae 8*

Expressed in Parts Per Million

UNIT NUMBER	S.A.E. USED	S.A.E. NOW	% FUEL DIL.	WATER	FUEL SOOT	GROSS METAL ABRAS.	SLUDGE INDEX	ACID INDEX	IRON	CHRO-MIUM	COPPER	LEAD	ALUM-INUM	SILI-CON	TIN	SOD-IUM	MAGNE-SIUM	SILVER	NICKEL
194 81115	30	20	5	X	X	X	4	7	35	1	1	8	2	3	6	1	19	1	1

SAMPLE DRAWN: JULY 26/79

ANALYSIS MADE: AUG 2/79

MCFLON FOR 100% These metal wear rates are all low to normal. The Silicon reading indicates good air cleaner efficiency. The fuel dilution level is above normal which warrants attention to the fuel injection system and has thinned the oil; other items on the engine show normal. The sludge volume is 1.5% indicating filter change is warranted. We recommend early attention to the fuel injection system. Both oil and filter are due for change now because of the above normal fuel dilution level.

Expressed in Parts Per Million

UNIT NUMBER	S.A.E. USED	S.A.E. NOW	% FUEL DIL.	WATER	FUEL SOOT	GROSS METAL ABRAS.	SLUDGE INDEX	ACID INDEX	IRON	CHRO-MIUM	COPPER	LEAD	ALUM-INUM	SILI-CON	TIN	SOD-IUM	MAGNE-SIUM	SILVER	NICKEL

SAMPLE DRAWN:

TOTAL MILES/HRS. ON UNIT:

ON OIL:

Expressed in Parts Per Million

UNIT NUMBER	S.A.E. USED	S.A.E. NOW	% FUEL DIL.	WATER	FUEL SOOT	GROSS METAL ABRAS.	SLUDGE INDEX	ACID INDEX	IRON	CHRO-MIUM	COPPER	LEAD	ALUM-INUM	SILI-CON	TIN	SOD-IUM	MAGNE-SIUM	SILVER	NICKEL

SAMPLE DRAWN:

TOTAL MILES/HRS. ON UNIT:

ON OIL:

AFTER

BUCK 8

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MRI, MIKTON GEN. MANAG.

11 AIRPORT CANADA  
MIKTON GENERAL MANAGER  
VICTORIAN INTERNATIONAL AIRPORT  
KELLOGG, B.C.

ENGINE OIL ANALYSIS

YARD 5

EXPRESSED IN PARTS PER MILLION																			
S.T. NUMBER	S.A.E. USED	S.A.E. NOW	% FUEL DIL.	WATER	FUEL SOOT	GROSS METAL	SLUDGE INDEX	ACID INDEX	IRON	CHRO- MUM	COPPER	LEAD	ALUM- INUM	SILI- CON	TIN	SODIUM	MAGNE- SIUM	SILVER	NICKEL
52	207	30	1.5	X	X	X	X	0.4											
52	30							0.3	NEG.	11	1	1	1		1	1	1	1	1

AMPLE DRAWN: DEC. 8/80

ANALYSIS MADE: DEC. 29/80

ON OIL 5063 M \*

TOTAL MILES/HRS. ON UNIT 19184 M

REMARKS: These metal wear rates are all low to normal. The silicon reading indicates good air cleaner efficiency. Fuel utilization level is borderline for attention. Oil viscosity shows a small decrease which is not of concern. The sludge volume is 1.5, indicating filter efficiency is good. This oil is suitable for at least another 3000 miles if fuel dilution does not rise.

— REQUIRES AT ATTENTION

X: NIL 1.5% B7 100% 100%

P.O. NO. 70 X-2411  
UNIT: 55-765

26 Oct

## Blue 19 PREVENTIVE MAINTENANCE METHODS LTD.

GASOLINE FUELED EQUIPMENT

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2480

Expressed in Parts Per Million

UNIT NUMBER	S.A.E. USED	S.A.E. NOW	% FUEL OIL	WATER	FUEL SOOT	GROSS METAL ABRAS.	GROSS METAL INDEX	SLUDGE INDEX	ACID INDEX	IRON	CHRO-MIUM	COPPER	ALUM-INUM	SILI-CONE	TIN	SODIUM	MAGNE-SIUM	SILVER	NICKEL
17 (A) GLUE 19	30	2.5	x	y	y	Tr	h	2	220	15	24	14	11	14	121	26	1	1	1

SAMPLE DRAWN: JULY 25/79

ANALYSIS MADE:

CHROLON FOR HOT; The wear rates for Iron and aluminum are well above normal and the reading for Copper is a bit above normal. This represents wear to rings and cylinder walls and pistons with the bearing of wear to bearings which is considered to be secondary wear. The primary wear is due to the entry of abrasive dust or dirt which is indicated by the high Sludge level. This warrants a check of the air intake system. The Sodium reading is also well above normal and this usually indicates that there is or has been contamination either by antifreeze solution or a cleaning agent. We find no evidence of either at this time. The fuel dilution level should not go higher but is still satisfactory for this type of service. The oil viscosity shows only a small reduction. The sludge volume is 1.0% indicating filter change is warranted. The oil still shows satisfactory in all other respects, but is due for a change.

UNIT NUMBER	S.A.E. USED	S.A.E. NOW	% FUEL OIL	WATER	FUEL SOOT	GROSS METAL ABRAS.	GROSS METAL INDEX	SLUDGE INDEX	ACID INDEX	IRON	CHRO-MIUM	COPPER	ALUM-INUM	SILI-CONE	TIN	SODIUM	MAGNE-SIUM	SILVER	NICKEL

SAMPLE DRAWN:

ANALYSIS MADE:

TOTAL MILES/HRS. ON UNIT:

ON OIL:

UNIT NUMBER	S.A.E. USED	S.A.E. NOW	% FUEL OIL	WATER	FUEL SOOT	GROSS METAL ABRAS.	GROSS METAL INDEX	SLUDGE INDEX	ACID INDEX	IRON	CHRO-MIUM	COPPER	ALUM-INUM	SILI-CONE	TIN	SODIUM	MAGNE-SIUM	SILVER	NICKEL

SAMPLE DRAWN:

TOTAL MILES/HRS. ON UNIT:

ON OIL:

After Blue 19

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AIRPORT GEN. MANAGER  
VANCOUVER INTERNATIONAL AIRPORT  
1000 11th St., B.C.

**ENGINE OIL ANALYSIS**

Y406

EXPRESSED IN PARTS PER MILLION

ITEM	S.A.E. USED	S.A.E. NOW	% FUEL OIL	WATER	FUEL SOOT	GROSS ABRAS.	GROSS METAL	SLUDGE INDEX	ACID INDEX	IRON	CHRO- MIUM	COPPER	LEAD	ALUM- INIUM	SILI- CON	TIN	SODIUM	MAGNE- SIUM	SILVER	NICKEL
1	20	30	2.5	X	X	TR	X	0.1 3	MET.	153	7	1	110+	12	16*	8	5	120+	1	1
2																				
3																				
4																				
5																				
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17																				
18																				
19																				
20																				

AMPLE DRAWN: NO. 72/10

ANALYSIS MADE: DEC. 29/80

TOTAL MILES/HRS. ON UNIT 31931 M ON OIL: 3933 M

HIGH CHROMIUM; (High) Silicon value is borderline for concern re dust entry. Wear levels still satisfactory. Change oil due to age. Other items on the engine show normal. Oil viscosity shows little change. The sludge volume is 0.1% indicating filter is good.

### CONCLUSIONS:

The continual reduction in wear rates is indicative of the lasting qualities of the T.F.E. resin film created by a Microlon Treatment. The percentages illustrated note at what greater rate the engines were wearing prior to treatment. The average is approximately 120%, or conversly, the engines are now wearing at less than half the rate after treatment with Microlon.

Although, at this time, the fuel consumption data is limited, it is significant to note that even though the engines are much older they are still consuming less fuel than before treatment. Even with a fuel consumption reduction of 3.6%, the use of Microlon is still economically viable. Using this percentage (which is very low compared with most controlled tests), at \$1.00 per gallon of fuel and an engine obtaining 6 miles per gallon, we could project a dollar savings of #360.00 within 60,000 miles. Obviously these savings will rise dramatically with the anticipated increase of fuel costs and a greater fuel consumption savings than 3.6%.

The savings resulting from the reduction of wear are manyfold. Downtime due to wear related problems is extremely costly when you consider the disruption of schedules, cost of parts and increased labour costs. Microlon is an investment. It is a means to substantially reduce maintenance caused by wear. It also has been proven, in controlled test conditions, to reduce oil consumption and hydrocarbon emissions.

Microlon Canada Ltd. is currently working with the Canadian Research Council to test some of Microlons' more "hard to believe" principles. We are confident that the findings will support the manufacturers claims and that much more extensive product testing will result.

Microlon is distributed in every province of Canada and is very well received in the private sector - both retail and industrial. We believe that in this age of needed energy conservation and reduction of overhead costs, Microlon should be used in every vehicle on the road today.