CITY WIDE IMPLICATIONS

CITY OF HAMILTON

TRANSPORTATION, OPERATIONS & ENVIRONMENT
Fleet Services

Report to:	Mayor and Members Hearing Sub-Committee	**Submitted by**:	Peter M. Crockett, P.Eng. General Manager
Date:	June 20, 2002	**Prepared by:**	Roy W. Duncan Extension 5965

SUBJECT: Fuel Additive Demonstration Project - City of Hamilton (TOE02128) (City Wide)

RECOMMENDATION:

(a) That Ferox Combustion Catalyst, MEA Technologies, be approved as the test product for the Fuel Additive Demonstration Project, City of Hamilton (Expression of Interest (C11-37-02) {Appendix A}) at a total estimated cost of $150,000.

(b) That the test be conducted on the Transit/DARTS diesel bus fleet and the entire municipal fleet.

(c) That staff report to Council on the results of the Fuel Additive Demonstration Project by the end of 2003.

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Peter M. Crockett, P.Eng., General Manager
Transportation, Operations & Environment

EXECUTIVE SUMMARY:

The City of Hamilton retained an independent consultant to conduct a fuel additive demonstration project with the objective of determining if fuel additives/ devices reduce fuel consumption in heavy duty diesel vehicles and the fuel cost savings, if any, relative to the cost of the additive/device.

The demonstration project will consist of a test of one product over a period of up to one year. In order to select the test product the City of Hamilton issued a Request for Expression of Interest. A product analysis was completed based on the data which was submitted. A Steering Committee consisting of representatives from Transit, Roads &

Traffic, Water/Wastewater, Fleet's Repair & Service, EMS (Fire and Ambulance) and Hydro was formed to ensure maximum exposure and consensus in approach.

The Steering Committee recommends that Ferox Combustion Catalyst, MEA Technologies, be approved as the test product for the Fuel Additive Demonstration Project based on an analysis of the responses to the request for an Expression of Interest.

BACKGROUND:

The City of Hamilton retained an independent consultant to conduct a fuel additive demonstration project with the objective of determining if fuel additives/ devices reduce fuel consumption in heavy duty diesel vehicles and the fuel cost savings, if any, relative to the cost of the additive/device.

Originally, it was the intention of the City of Hamilton to conduct the demonstration using a study group of up to 98 diesel buses with an average annual fuel consumption of 3,300,000 litres. The City has now added 45 DARTS vehicles with an average annual fuel consumption of 560,000 litres to the study group.

The demonstration will consist of a test of one product over a period of up to one year. The variables which will be monitored will include: total fuel consumed; total kilometres driven (a) in service and (b) other; total operating time (a) in service and (b) other; and additive volume used (if applicable). The gross fleet average results will be compared to three year historical data.

The City of Hamilton prepared a Request for Expression of Interest (Contract C11-37-02) as attached to this report (Appendix A). The intention of the City was to prepare a short list of product lines to be invited to a subsequent Request for Proposal such that one product may have been chosen for testing. Five fuel additives and two devices were submitted for consideration. A product analysis was completed based on the data which was submitted.

At this time, the Steering Committee formed to oversee this project is recommending that, because only seven products were submitted for consideration and because Ferox Combustion Catalyst, MEA Technologies, rated above the other six products in the analysis, the City not proceed with a Request for Proposal.

ANALYSIS OF ALTERNATIVES:

A total of five fuel additives and two devices were submitted for consideration. The product analysis focused on a comparison of data submitted and total approximate cost for each product.

The completeness and significance of data submitted was measured individually for each item on the Request for Expression of Interest. Each item received equal weight with data submitted receiving a possible score of 0-1-2. Total score was calculated as the sum of individual scores.

Total approximate cost was calculated based on total volume or quantity of product needed to treat fuel for 98 diesel buses for one year. The total approximate cost calculated does not include taxes, shipping and/or installation (if applicable).

A summary of data submitted, and calculation of total score and total approximate cost is attached to this report (Appendix B).

Table 1 is a categorized summary of product, total score and approximate cost for 98 Transit buses.

TABLE 1 PRODUCT SUMMARY (FOR 98 TRANSIT BUSES)

Product	Score	Cost
Ferox Combustion Catalyst	28	$28,558
Lubrication Engineers 2400 DC1 Plus	24	$46,359
Muscle Products FT-10	20	$85,421
Power Up GEN49D	24	$45,144
RXP	24	$14,229
Magna -Tek Magnetic Induction Device	25	$35,280*
Tadger	26	$68,992*

* One time cost

Ferox Combustion Catalyst received the highest overall score because data submitted included the most complete and significant information related to product specification and testing. No other additive received higher scores for those items on the Expression of Interest. City of Hamilton, Fleet Services has information regarding the chemical make up of Ferox which it does not for any other of the fuel additives.

Ferox Combustion Catalyst did not have the lowest total approximate cost. RXP fuel additive submitted a lower cost. However, because no product specification and insufficient testing (specific to fuel economy) was submitted, the total score for RXP was not deemed acceptable. Magna-Tek Magnetic Induction Device and Tadger submitted one time costs (not including installation) that may prove to be more economical if the product is installed for longer than the duration of the demonstration project. However, their technology was not sufficiently tested and the total score was not deemed acceptable. Further, the difficulty of installation and possible mechanical problems arising from weight of the product led to lack of confidence in the devices.

It is recommended that Ferox Combustion Catalyst, MEA Technologies, be approved as the test product for the Fuel Additive Demonstration Project based on an analysis of the responses to a request for an Expression of Interest.

In addition, staff recommend that the use of the Ferox product be expanded to include the balance of the fleet for the duration of the demonstration project. The extent of the evaluation of this, as part of the project, will include “Clean Air” emissions testing as required on the fleet and an overall comparison of before and after results.

MEA Technologies has submitted a letter of confirmation which indicates the total cost to conduct the demonstration using a study group of 98 diesel buses and 45 DARTS vehicles. This total cost is in the sum of $43,756.00 and includes shipping and taxes. A letter of confirmation of total cost submitted by Ferox Combustion Catalyst, MEA Technologies is attached.

FINANCIAL/STAFFING/LEGAL IMPLICATIONS:

Financial: Beyond the cost of the product, which is in the 2002/2003 Fleet operating budget, there are no budget implications. It is hoped that the experiment will lead to less fuel consumption and reduced overall costs.

Staffing: There are no additional staff requirements.

Legal: There are no known legal implications.

POLICIES AFFECTING PROPOSAL:

N/A

CONSULTATION WITH RELEVANT DEPARTMENTS/AGENCIES:

A Steering Committee has been formed to oversee this demonstration project. The Committee members are as follows:

Roy Duncan, Fleet Services
Paul Thompson, Transit
Martin White, Roads & Traffic
Peter Christie, Water/Wastewater
John Hamilton, Repair & Service, Fleet Services
Bob Kay, Chief Mechanical Officer, Fire and Ambulance
John Noble, Hydro

CITY STRATEGIC COMMITMENT:

This trial use of a fuel additive is consistent with the City's objective of reducing emissions and reducing operating costs.

Appendix A

THE CITY OF HAMILTON

EXPRESSION OF INTEREST

FUEL ADDITIVE DEMONSTRATION PROJECT

CITY OF HAMILTON, FLEET SERVICES

Contract Number: C11-37-02

Closes: Friday, April 26, 2002

Purchasing Division
Finance & Corporate Services

Contract. No. C11-37-02

EXPRESSION OF INTEREST

The City of Hamilton has retained an independent contractor to conduct a fuel additive demonstration project with the purpose of determining if fuel additives/devices reduce fuel consumption in heavy duty diesel vehicles and the cost savings relative to the cost of the product.

The City of Hamilton will be preparing a short list of product lines to be invited to a subsequent Request for Proposal such that one product may be chosen for testing and/or purchase.

Sealed Expressions of Interest addressed to the Manager of Purchasing, Standard Life Building, 120 King Street West, 9th Floor, Suite 900, Hamilton, ON, L8P 4V2 will be received at **only** the Purchasing Division up to and including **ELEVEN o'clock a.m. Local Time Friday, April 26, 2002** for the above.

Expression of Interest documents may be obtained in the Purchasing Division, 9th Floor, 120 King Street West, Hamilton, ON between 9:00 a.m. and 4:30 p.m. – **FREE OF CHARGE.**

If unable to attend in person you may arrange to forward your completed return courier waybill, including your account number with the courier, and envelope; and have the courier pick up on your behalf. **The Purchasing Division must be contacted at telephone number (905) 546-2773 and informed of this so that staff may prepare the package for pickup by courier**. Documents will not be sent out by collect shipment by courier, and the City will not be responsible for any lost deposit.

Manager of Purchasing
City of Hamilton

Contract C11-37-02

Request for Expression of Interest

Fuel Additive Demonstration Project
City of Hamilton, Fleet Services

The City of Hamilton has retained an independent contractor to conduct a fuel additive demonstration project with the purpose of determining if fuel additives/devices reduce fuel consumption in heavy duty diesel vehicles and the cost savings relative to the cost of the product.

The demonstration project will consist of a test of one product over a period of up to one year. The variables which will be monitored will include: total fuel consumed; total kilometres driven (a) in service and (b) other; total operating time (a) in service and (b) other; and additive volume used (if applicable). The gross fleet average results will be compared to three year historical data.

It is the intention of the City of Hamilton to conduct this demonstration on the entire Hamilton Street Railway (HSR) bus fleet. The diesel fleet consists of 98 heavy duty urban transit buses. Table 1 shows the fleet makeup by manufacturer, engine type and age profile. The annual planned total kilometres driven by the diesel fleet is 5,600,000 km and 3,300,000 litres of fuel are consumed.

Table 1 ~ TRANSIT BUS MODELS

Quantity	Year	Make	Model	Engine	Fuel	Transmission	Seats	GVW (kgs)
5	1982	GM	TA60102N	8V71	D	V-730	60	20,000
14	1985	GM	TC40102N	6V71	D	V-731	47	15,400
15	1986	GM	TC40102N	6V71	D	V-731	46	15,400
15	1987	GM	TC40102N	6V92TA	D	V-731	46	15,400
14	1988	MCI	TC40102N	6V92TA	D	V-731	46	15,400
15	1989	OBI	Orion V	6V92T	D	ZF4HP590	44	15,000
20	1997	Nova	LFS	C8.3	D	ZF5HP590	35	15,000

D = Diesel

The City of Hamilton will be preparing a short list of product lines to be invited to a subsequent Request for Proposal such that one product may be chosen for testing and/or purchase. This Request for Expression of Interest is being advertised in the Hamilton Spectator and sent to known potential vendors. If you or your firm is an applicant then you must provide the following minimum data in response to this Request for Expression of Interest before any further consideration may be given to your product.

1. Marketing information including product trade name/marketing name. Name and address of the individual or corporation applying for this evaluation. Name of person(s) who are authorized to represent the organization and who will be the principal contact.
2. A statement of company background including years in business and/or other pertinent information including patent protection information, and name of product manufacturer.
3. A description of the product and the purpose /objective of the product as it relates to improvements in fuel economy, emissions and/or driveability.
4. A statement indicating which types or groups of vehicles and conditions (i.e. weather) for which the product is, or is not applicable.
5. For products which are fuel additives, a copy of the product specification and/or a chemical analysis by a recognized national testing laboratory for the primary active ingredients and for the carrier ingredients, and/or mixing instructions for the product (indicate tools, equipment and skills required).
6. For products which are devices, a copy of drawings and/or schematics, installation instructions for the product (indicate tools, equipment and skills required) and maintenance procedures where applicable.
7. An explanation of the mode of action of the product as it relates to improvements in fuel economy, emissions and/or driveability.

8. A listing of possible harmful effects on mechanical components by considering corrosion, elastomer compatibility, engine sequence testing, filter media compatibility, filter plugging, lubricity and water tolerance and/or any other that apply as defined by the Detroit Diesel Corporation Fuel Additives literature.
9. Material Safety Data Sheet (MSDS).
10. A copy of any Federal and/or Provincial certification.
11. Copies of test reports and/or product evaluations by Environment Canada and/or the Environmental Protection Agency approved laboratories, universities and/or other independent laboratories. These reports must state test size, methodology, results and supportive data.
12. Copies of published articles from recognized professional and/or trade magazines or journals concerning product testing results and other documented results.
13. A current list of fleet systems which operate fleets similar in size, equipment and operation which use the product and may be contacted directly.
14. Copies of letters from the major diesel engine manufacturers stating their warranty policy with respect to use of the product.
15. Copies of letters from the major diesel fuel suppliers stating their policy with respect to use of the product.
16. A written statement of product cost, estimated installation/mixing cost and time, and any quantity discount breakdown which could apply. State fuel savings relative to product cost.
17. A written statement of product availability including identification of local distributor, delivery method and required delivery lead time.
18. Proof of liability insurance.
19. Proof of ability to obtain a Letter of Credit. The Request for Proposal will require the submission of a Letter of Credit to recover costs for damage or destruction of bus engines or other components.

GENERAL CONDITIONS

The Expression of Interest must be organized to address each of the nineteen items listed above.

The attached Expression of Interest Form shall be included in your submission and shall be signed by an officer of the company.

The applicant must submit eight (8) copies for consideration. Company brochures may be attached to the Expression of Interest.

The complete Expression of Interest will be reviewed and a selected short list of applicants will be sent a Request for Proposal with a project Terms of Reference which will assist them in the preparation of their proposal. The selected applicants will then submit a detailed proposal on how their product can meet the demands of the demonstration project.

Sealed Expression of Interest referenced to the project, addressed to Manager of Purchasing, Standard Life Building, 9th Floor Suite 900, 120 King Street West, Hamilton, ON, L8P 4V2 will be received at **only** the Purchasing Division up to and including **ELEVEN o'clock a.m. Local Time Friday, April 26, 2002** for the above.

Questions related to this Expression of Interest, Contract C11-37-02 or the intent of the proposed demonstration project are to be directed to:

Wayne A. Kay, B.Sc., Associate, Transportation Analyst
SERNAS TRANSTECH
141 Brunel Road
Mississauga ON L4Z 1X3
T 416.213.7121 F 905.890.8499
wkay@sernastranstech.com

Appendix B

ANALYSIS OF RESPONSES TO THE REQUEST FOR EXPRESSION OF INTEREST
FUEL ADDITIVE DEMONSTRATION PROJECT
CITY OF HAMILTON, FLEET SERVICES

Project Purpose:

1) to determine if fuel additives/devices reduce fuel consumption in heavy-duty diesel vehicles

2) to identify a (fuel) cost savings relative to the cost of the product

3) to test one product over a period of up to one year using the HSR bus fleet

Fleet Information:

1) 98 diesel fuelled urban transit buses

2) annual fuel consumed = 3,300,000 lit.

3) annual km driven = 5,600,000 km

Variables Monitored:

1) total fuel consumed

2) total kilometres driven

3) in-service kilometres

4) total operating time

5) in-service time

6) additive volume used (if applicable)

Comparative Data:

Demonstration project using gross fleet averages

versus

Historical (3-year) data using gross fleet averages

Expression of Interest Analysis
 # 1 Product Information and # 2 Marketing Information

- Fuel Additive Products = 5 submissions

Ferox Combustion Catalyst
(Canadian distributor)
MEA Technologies, Hamilton, ON
Principle contact: Brian Docherty
Business history = 7 years in Canada (distr.)
Sourced from Parish Chemical (Utah)

Lubrication Engineers 2400 DC1 Plus
Davis Controls Ltd. , Oakville, ON
Principle contact: Christopher Barnes
Business history = 51 years in U.S. (manuf.)
Sourced from Lubrication Engineers (Texas)

Muscle Products FT-10 Fuel Treatment with
MT-10 Metal Treatment (oil)
TWF Lubricants Ltd., Mississauga, ON
Principle contact: Blaine Mitton
Business history = 4 years in Canada (distr.)
And 17 years in U.S. (manuf.)
Sourced from Muscle Products (Pennsylvania)

Power Up GEN 49D with Anti-Gel
Preventative Maintenance Products Inc.,
Straffordville, ON
Principle contact: Dan Buehner
Business history = 20 years in Canada (manuf.)
Sourced from Maryn International (Calgary, AL)

RXP Fuel Additive
RXP Products Inc., St Petersburg, Florida
Principle contact: Don Woodward
Business history = 12 years in U.S. (distr./manuf.)
Sourced from RXP Products (Florida)

- Fuel Line Devices = 2 submissions

Magnetic Induction Device (Magna-Tek)
Magna-Tek Solutions Inc., Mississauga, ON
Principle contact: Paul Meddick
Business history = 7 years in Canada (distr./manuf.)
Sourced from Magna-Tek (Mississauga, ON)

Tadger
The Tadger Group International, Grimsby, ON
Principle contact: John Mogford
Business history = 1.5 years in Canada (distr./manuf.)
Sourced from Diversitech Systems (Waterloo, ON)

	ADDITIVES					DEVICES	
	Ferox	Lub. Eng. 2400 DC1 Plus	Muscle FT-10 + MT-10	Power Up GEN49D + A-G	RXP	Magna-Tek	Tadger
#3 Purpose/Claims:							
Improves Fuel Economy (by reducing fuel consumption)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Claimed Fuel Savings	3-10%	7.4%	5-20%	2-6%	1-10%	6-18%	2.5%
Increases Power/Performance		Yes	Yes			Yes	
Reduces Emissions	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reduces Deposit Formation or Reduces Carbon/Cleans Engine	Yes		Yes		Yes		
Extends Engine/Parts Life (by improving lubricity/reducing wear therefore reducing maintenance)	Yes	Yes	Yes	Yes		Yes	
Other:							
Cools Exhaust	Yes						
Improves 'Cold' Operation		Yes		Yes			
Fuel Preservative		Yes					
#4 Applicability:							
Any Fossil Fuel Engine	Yes				Yes	Yes	
All Diesel Engines		Yes		Yes (low S)			
Diesel and Gasoline			Yes				Yes
#5 Technical Data:							
Primary Ingredient	Yes (kerosene)	Yes (kero/nap)		(on request)			
#6 Drawings/Installation:						Yes clamps on-line	Yes in-line (as filter)
#7 Mode of Action:							
More Complete Combustion	Yes	Yes	Yes	Yes	Yes (temp. incr.)	Yes	Yes
Lower Combustion Temperature	Yes						
Detergent/Oxidation Inhibitor		Yes		Yes			
Minimizes Deposits/Dissolves	Yes		Yes	Yes	Yes	Yes	Yes
Detailed Information	Yes	No	No	No	No	Yes	Yes
#8 Safety/No Harmful Effect:	Yes	Yes	Yes (listed)	Yes	Yes	Yes (computer)	Yes
#9 MSDS Provided:	Yes	Yes	Yes	Yes	Yes	Yes (n/a)	Yes

	ADDITIVES					DEVICES	
	Ferox	Lub. Eng. 2400 DC1 Plus	Muscle FT-10 + MT-10	Power Up GEN49D + A-G	RXP	Magna-Tek	Tadger
#10 Government Certification:	No	No	No	No	No	No	No
#11 Testing Trials:	EC: 7% savings on buses	No	No	No	Independent (inconclusive)	No	EC: inconclusive on postal vans
#12 Published Articles:	No	No	No	No	Yes	On Magnets	No
#13 History of Use:	Hamilton ES Hamilton Hydro Other Fire Dept Welland Fleet (not transit) Waste Mgmt	Fleet Use (no data) School Buses St. AnneTrucks	Single Vehicle Endorsements (no data)	Freightliner Test Railway/China Danford Trucks	Gas Vehicles Railway/U.S. Ringhaver CAT Dardanelle Trucks	Hall Transport Trent River Truck Lines Landfill CAT	York Region (single bus test)
#14 Engine Manufacturers:	No	No	No	No	No	No	No
#15 Diesel Fuel Suppliers:	No	No	No	No	No	No	No
#16 Product Costs:							
Drum Size (lit.)	208	208	208	205	208	n/a	n/a
$Cdn/Drum	$9,000	$2,922	$3,446	$4,674	$1,148		
$Cdn/Litre	$43.27	$14.05	$16.57	$22.80	$5.52		
$Cdn/Vehicle						$360	$704
Hours to Install/Bus				(5% discount)	(U.S. x 1.63)	1 (assumes not installed)	1
Mixing Rate:							
Mix Rate	1/5000	1/1000	1/640 (FT-10) 2 oz. / 10 gal.	1/2500 Summer 1/1250 Winter	1/1280 1 oz. / 10 gal.	n/a	n/a
Mix Ratio	0.0002	0.001	0.00156	0.0006 (50/50)	0.00078		
Required (lit. or veh.)	660	3300	5156	1980	2578	98	98
Annual Expense	$28,558	$46,359	$85,421	$45,144	$14,229		
Total Device Cost						$35,280	$68,992
Est. Installed @ $70/hr						$6,860	$6,860
#17 Availability:	U.S. 2 weeks	Oakville	Mississauga	Calgary 10 days	U.S. 2 days	Mississauga (inventoried)	Grimsby (inventoried)
#18 Liability Insurance	Yes (manuf.)	Yes	Yes	Yes (expired)	Yes (expired)	Yes (on request)	Yes
#19 Proof/Letter of Credit	Yes (on request)	Yes		Yes (on request)			Yes

ESTIMATED PRODUCT EXPENSES AND SAVINGS

EXPENSES/SAVINGS			ADDITIVES					DEVICES	
			Ferox	Lub. Eng. 2400 DC1 Plus	Muscle FT-10 Only	Power Up GEN49D + A-G	RXP	Magna-Tek	Tadger
Product Costs:									
Annual Use Cost			$28,560	$46,360	$85,420	$45,140	$14,230		
Est. Installed Cost								$42,140	$75,850
Cost/year (18 yrs)			$28,560	$46,360	$85,420	$45,140	$14,230	$2,341	$4,214
Cost Ratios (18 yrs)			2.0	3.3	6.0	3.2	1.0	0.2	0.3
Fuel Savings *:									
at	1%	Savings			$19,800			$19,800	
	2%				$39,600			$39,600	
	3%				$59,400			$59,400	
	4%				$79,200			$79,200	
	5%				$99,000			$99,000	
Break-even (years):									
at	1%	Savings	1.4	2.3	4.3	2.3	0.7	2.1	3.8
	2%		0.7	1.2	2.2	1.1	0.4	1.1	1.9
	3%		0.5	0.8	1.4	0.8	0.2	0.7	1.3
	4%		0.4	0.6	1.1	0.6	0.2	0.5	1.0
	5%		0.3	0.5	0.9	0.5	0.1	0.4	0.8

*based on 3,300,000 litres total annual consumption at an average cost of $ 0.60/litre

SUMMARY OF PRODUCT SCORING

INFORMATION		ADDITIVES					DEVICES	
		Ferox	Lub. Eng. 2400 DC1 Plus	Muscle FT-10 + MT-10	Power Up GEN49D + A-G	RXP	Magna-Tek	Tadger
1	Product/Marketing Info	2	2	2	2	2	2	2
2	Manuf. Background	2	2	2	2	2	2	2
3	Purpose/Claim	2	2	2	2	2	2	2
4	Diesel Applicability	2	2	2	2	2	2	2
5/6	Technical Data/Drawings	2	1	0	1	0	2	2
7	Mode of Action	2	1	1	1	1	2	2
8	Safety/No Harmful Effect	2	2	2	2	2	2	2
9	MSDS	2	2	2	2	2	2	2
10	Gov't Certification	0	0	0	0	0	0	0
11	Testing Trials	2	0	0	0	1	0	1
12	Published Articles	0	0	0	0	2	1	0
13	History of Use	2	2	1	2	2	2	1
14	Engine Manuf. Endorsed	0	0	0	0	0	0	0
15	Diesel Fuel Endorsed	0	0	0	0	0	0	0
16	Mix Rate/Cost	2	2	2	2	2	2	2
17	Availability/Delivery	2	2	2	2	2	2	2
18	Liability Insurance	2	2	2	2	2	2	2
19	Letter of Credit	2	2	0	2	0	0	2
	Total:	28	24	20	24	24	25	26
	Percent:	78%	67%	56%	67%	67%	69%	72%
	Cost Ratios:	2.0	3.3	6.0 (annual)	3.8	1.0	0.2 (one-time)	0.3

Scoring:
0 Insufficient information provided
1 Questionable significance or incomplete information provided
2 Adequate information provided

Additional Information: Test Trials/User History (Items # 11, 12 &13)

Ferox

1) Environment Canada testing using urban transit buses resulted in a 4.6 to 7% improvement in fuel economy
2) Fire Department (in Hamilton) claims 4 to 6% improvement in fuel economy including use of a less expensive fuel grade
3) Hydro fleet (in Hamilton) shows an improvement of 7% in fuel economy by comparison of two years
4) Five waste management vehicles (in Leesburg, FL) showed an average 7% improvement in fuel economy
5) Welland fleet (not transit) reports no failed emissions tests after 2 years of use (contacted)

Lubrication Engineers 2400 DC1 Plus

1) Five tractor-trailer fleets (in western U.S.) ranging from 4-20 vehicles with 3.4 to 13.1% improvement in fuel economy
2) Fleet of 58 school buses (in Wisconsin) with 5.1% improvement in fuel economy
3) Combined = 113 vehicles with 7.4% average improvement in fuel economy
4) St. Anne Transportation reports improvements in fuel economy of 8% in new and 1% in old diesel trucks (contacted)

Muscle Products FT-10 + MT-10

1) Fuel + engine (oil) treatment for 4 months on a single cement truck with > 20% improvement in fuel economy
2) Fuel + engine (oil) treatment indicated 3% improvement in fuel economy based on the same engine
3) Fuel + engine (oil) treatment in an 'International' truck operated by TNT Olex (in Thorold, ON) provide 13% improvement in Fuel economy compared to other trucks
4) Several private endorsements for combination treatment in gasoline vehicles (no data to support claims of improved fuel economy)

Power Up GEN49D

1) Freightliner test vehicle using an on-board computer recorded a 9 to 10.7% improvement in fuel economy
2) Diesel locomotives (in China) showed a 2% improvement in fuel economy
3) Danford Construction (in Madoc, ON) reports reduced fuel consumption in (Cummins) diesel vehicles (contacted)

RXP

1) Two gasoline fuelled vehicles showed an average 2.2% improvement in fuel economy
2) Two diesel locomotive tests (in U.S.) showed a 2.5% and 6% improvement in fuel economy
3) Ringhaver CAT (in St. Petersburg, FL) claims 4 to 5% improvement in fuel economy with a 2,000 vehicle fleet over 9 months

4) Dardanelle School System reports better fuel economy and less deposits with 4 years use in diesel trucks (less fuel gel) (contacted)

Magna-Tek

1) Dozer at Britannia Landfill (in Mississauga) had an 18% improvement in fuel economy in a 3 month trial

2) Trent River Truck Lines (in Peterborough) claims > 20% improvement in fuel economy with a Kenworth diesel truck

3) Hall Transport (in Ayr) claims 3-4% improvement in fuel economy in side-by-side truck operations to western Canada, including in the winter (less fuel gel) (contacted)

Tadger

1) Three diesel fuelled Canada Post delivery vans tested by Environment Canada showed a 1.5% improvement in fuel economy (statistically significant?)

2) York Region Transit tested for 6 weeks on a single bus and reported reduced emissions (contacted)

FEROX
MEA TECHNOLOGIES INC.
CANADIAN DISTRIBUTOR

P.O Box 32030
Stonechurch Postal Outlet
1070 Stonechurch Rd. E.
Hamilton, Ontario L8W 3L3
Tel. (905) 575-8626
Fax (905) 575-8046

June 14, 2002

Manager of Purchasing
City of Hamilton
C/O Sernas Transtech
141 Brunel Rd.
Mississauga, Ontario
L4Z 1X3

Dear Sir:

We are very pleased to submit the following price quotation for the FEROX combustion catalyst as per contract number C11-37-02.

For the Hamilton Street and Railway and the DARTS fleet would be as follows.

4 Barrels of FEROX 230 @ $9000 per barrel = $36,000.
Shipping..... @ $512.25 each = 2,049.
Sub-total.....$38,049.
GST.....2,663.43
PST.....3,043.92

Total. $43,756.35

(note: a 50% deposit of $21,878.17 will be required at ordering time with the balance due 15 days from final invoice)

In respect to the actual treating of the fuel at HSR, it would be the responsibility of the HSR. I would however want to demonstrate how simple the procedure is before the testing begins.

For the City of Hamilton Fleet would be as follows.

8 Barrels of FEROX 230 @ $9000 per barrel = $72,000.
Shipping..... @ $512.25 each = 4,098.
Sub-total.....$76,098.
GST.....5,326.86
PST.....6,087.84

Total .$87,512.70

(note: a 50% deposit of $43,756.35 will be required at ordering time with the balance due 15 days from final invoice)

With respect to the Hamilton fleet, I would be prepared to as I have in the past 9 years help with treating some of the yards. Again, the actual dispensing of FEROX into city yards is a very simple procedure which I could demonstrate to specific city yard personnel along with showing how to properly log each treatment.

"It's Time to Clear the Air, with Ferox™"

In closing, we thank-you for allowing us to quote on your valued business. Should you have any questions please feel to contact me directly on my cell phone (905) 541-4574.

Sincerely,

Brian Docherty

cc. Peter M. Crockett, P. Eng., General Manager
Transportation, Operations & Environment

29 January 1997

Evaluation of Ferox - Fuel Catalyst for Reducing Exhaust Emissions and Increasing Fuel Economy

One of the solutions for reducing the exhaust emissions from heavy duty diesel engines is the modification or reformulation of existing diesel fuels. A recent example of the latter was the introduction of low sulfur diesel fuels. For the modification of fuels, a technique that is employed is to add small volume percentages of chemicals to the existing fuel. In general, these additives/catalysts have been designed to modify the combustion process with the targeted benefits of reduced fuel consumption and exhaust emissions. The following information concerns a testing program that was conducted on such a product. Ferox, a fuel catalyst developed by Parrish Chemical in the US and distributed in Canada by MEA Technologies of Hamilton was the focus of a collaborative government/industry urban bus exhaust emissions and fuel consumption evaluation program.

The Mobile Sources Emissions Division, Environment Canada, agreed to support a testing program to evaluate Ferox under laboratory controlled conditions to determine its effectiveness for reducing exhaust emissions and fuel consumption. Three DDC 6V92 engine powered urban buses of the same vintage and configuration, one as a control and the other two using diesel fuel treated with Ferox, were laboratory chassis dynamometer tested for exhaust emissions after 0, 400 and 1000 hours of regular inservice operation. At each of these points, all three buses were tested over simulated driving cycles designed to generally represent a city/suburban operation. The exhaust emissions that were determined included total hydrocarbons(THC), carbon monoxide(CO), oxides of nitrogen(NOx), particulate mass(PM), carbon dioxide(CO2), volatile organic compounds(VOC), carbonyls and polycyclic aromatic hydrocarbons(PAH). The first three compounds are referred to as the criteria emissions as they are regulated by both the Canadian and United States federal governments. The remaining emissions except for CO2 are unregulated constituents of the exhaust stream. Fuel economy was determined by the carbon balance method which involved a calculation based on the measurements of the carbon compounds in the fuel.

As Ferox was developed to improve the combustion characteristics of an inuse engine over a period of time, it was expected that the maximum benefits accruing from the use of the catalyst would occur by 1000 hours of engine operation. Thus, the differences determined in the exhaust emissions and fuel economy between the zero hours(baseline) and 1000 hours represents the expected improvements with the use of the product. For purposes of taking into consideration normal engine/vehicle variability over time, the control bus results served as the average that would be expected over this length of time. Any changes outside of this range would then be attributable to the Ferox.

The test design consisted of the three buses to be tested over two cycles ie. the Central Business District(CBD) and the New York Bus Composite(NYBC). The test plan required that each bus undergo a total of four 'hot start' repeats of each cycle, on both the diesel control fuel and the diesel fuel treated with Ferox. While the buses were in normal inservice accumulation, the fuel used was the same as supplied to the local transit authority plus the recommended quantity of Ferox added by an MSED technician.

The results from this evaluation indicate that fuel economy consistently improved with the continual use of the Ferox treated diesel fuel. The average increases for the treated buses at 1000 hrs were 7.0% for the CBD and 4.6% for the NYBC. With the control bus being factored in, the results indicated increases of up to 6.1% for the CBD and up to 5.5% for the NYBC. The variability in these increases could be attributable to maintenance conducted on one of the Ferox treated buses (#8919) and the control bus which could have resulted in the smaller percentage gains. For bus #8919, a number of maintenance problems including the replacement of a fuel injector on two separate occasions, were experienced. The bus specific results are found in the following table

Table Percentage Increases in Fuel Economy

BUS	CBD	NYBC	AVERAGE
8919	1.6	0.8	1.2
8939	**12.3**	**8.4**	10.4
8915 (control)	**6.2**	**2.9**	4.6

Note. Bold values are statistically significant

With respect to the exhaust emissions, the data indicated a consistent reduction in CO2 corresponding to the increases in fuel economy. For NOx, though the average results increased over time, these values were less than the increases as measured from the control bus. The particulate mass measurements resulted in a decrease in this criteria emission for three of the four test sequences. The control bus indicated the same trend but with larger percentage decreases. The CO results were more variable, with decreases for the CBD and increases for the NYBC. THC data from one of the buses indicated an average statistically significant reduction of 8.8%. The following table summarizes the results for the criteria exhaust emissions and CO2.

Exhaust Emissions at 1000 hr (gm/mi) and % change compared to Zero hr.

Bus	Cycle	THC	CO	NOx	PM	CO2
8919	**NYBC**	2.89	13.7	20.1	3.06	2652
	% chg	[+10]*	[+22]	[-4.7]	[+35]	[-1]
	CBD	2.16	7.1	15.9	2.11	2578
	% chg	[+5]	[-12]	[+8]	[-1]	[-2]
8939	**NYBC**	3.0	13.2	18.65	2.60	2608
	% chg	[-8]	[+3]	[+17]	[-6]	[-8]
	CBD	2.39	6.88	15.2	1.98	2493
	% chg	[-9]	[-4]	[+2]	[-14]	[-18]

*Note. [+] refers to an increase

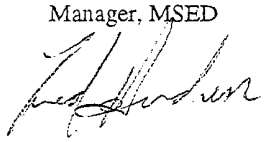
The other known compounds in the exhaust stream are not regulated at this time although a number of these are on Canada's Priority Substance List. The carbonyls, VOC and PAH discussed above were included in this study as they are known to exist in diesel engine exhaust streams and contain specific compounds known to be hazardous to human health. The carbonyls, consisting primarily of formaldehyde and acetaldehyde were measured and analyzed using pre-prepared cartridges and liquid chromatography. The results indicated that for the total carbonyl analysis, the Ferox treated buses had slightly greater reductions than the control bus. For acetaldehyde, the average reductions of 41% were twice that indicated by the control bus. Formaldehyde, which is normally 50 to 90% of the total carbonyls in the exhaust stream followed the same trend but the reductions were only approximately 5% larger than the control bus.

The second important category of unregulated exhaust emissions from these vehicles is PAH, of which 15% is in the gaseous form and the remaining 85% adheres to the particulate. During the baseline testing an average of 14 compounds were identified. This decreased to 10 at the 1000 hr point with 4 being at the

non-detectable level for the analysis instrumentation The 1000 hr testing also indicated that all of the identified PAH compounds were decreased when the Ferox treated fuel. This was the case for both buses with reductions in the range of +50% for three of these compounds.

In summary, based on the methodology and vehicles used in this program, the Ferox treated fuel was effective in increasing fuel economy and reducing some of the compounds in the tailpipe exhaust stream including THC, NOx, CO2, formaldehyde, acetaldehyde and PAH.

Prepared by Fred Hendren
Manager, MSED



CORPORATION OF THE CITY OF HAMILTON

MEMORANDUM

****

TO:	Mr. B. Docherty V/P MEA Technologies/Ferox	YOUR FILE:	
FROM:	Mr. C. Guthro Manager of Fleet Services Fleet Services Division	OUR FILE: PHONE:	
SUBJECT:	Fuel Catalyst	DATE:	1996 April 22

This is to inform you that your product, Ferox combustion catalyst, has met the requirements of our testing and has indicated a reduction of polluting emissions and particulate smoke. Our tests exhibit a payback analysis through improved combustion efficiency resulting in reduced fuel consumption.

Our oil analysis has shown an improvement in the condition of the oil which has afforded us the opportunity to extend our oil change intervals, with the continued use of your product, oil analysis and testing, we hope this trend continues.

We have agreed to the terms of your quote for the supply of Ferox and will be ordering our six months quantity for the fleet of the City of Hamilton.

cg\ Charles Guthro

cc. Laurel Barker, Administrative Coordinator

Hamilton Fire Department
City of HAMILTON
55 King William Street, Hamilton, Ontario, L8R 1A2
Tel. (905) 546-3333 / Fax (905) 546-3344

August 16, 1994

COPY

Mr. George Zegarac, Manager
Research and Technology Section
Ontario Ministry of the Environment

Dear Sir:

Re: Ferrox Fuel Additive

Please be advised that the Hamilton Fire Department is not promoting or endorsing the subject product. We are however, stating factual information discovered through field evaluations. We estimate that the full results of this product will not be realized for a user period of two years within the fire service. However, based on the satisfactory results obtained to date, we have expectations that this product will prove successful in fulfilling its proclamation.

For several years, the Hamilton Fire Department has been considering many methods of dealing with diesel fumes and exhaust particulate in their fire stations. Everything from ceramic filters and dual exhaust systems to exhaust evacuation systems have been researched. Some methods appeared obviously more effective than others, however, all considered methods were similar in that they were costly to install and maintain. None of these systems were solving the air quality problem, but were merely venting the smoke and fumes to the atmosphere. After consulting with several fire departments around the Province and hearing some of the adverse results surrounding the different systems, it was decided that our investigation would continue.

A local company in Stoney Creek, Ontario, approached the Hamilton Fire Department with a unique proposition. Ferrox Canada delivered a very detailed report for scrutinization. Four Hamilton Fire Department vehicles were selected based on age and history of heavy smoke conditions. A nine-month trail period was conducted and monitored by Hamilton.

The Mechanical Division of the Hamilton Fire Department were the only personnel who ensured that the product was put into the fuel dispensing system. After the nine-month trial period, the subject vehicles were tested at Mohawk College in Hamilton. Two, six-gas

analyzers were used to record data, as well as transparent in-line fuel filters to collect heavy particulate, smoke and carbon. The gas analyzers were operated by technicians from Mohawk College. The apparatus was operated by myself, Chief Mechanical Officer. They were tested under no-load and full-load conditions, from idle speed, quarter, half, three quarter and full throttle conditions.

The test was carried out four different times on each of the four vehicles. Two of the vehicles were triple-combination pumpers and two were similar rescue units with identical engines.

The testing showed a marked reduction in smoke in the vehicles treated with Ferrox Fuel Additive. Exhaust emissions and black exhaust smoke were visibly reduced. As a result of this testing, the Hamilton Fire Department is in the process of using Ferrox Fuel Additive in all of the department's diesel storage tanks.

If I may be of further assistance in this regard, please feel free to contact me.

Yours truly,

Robert J. Kay

R. J. KAY
Chief Mechanical Officer

RJK/cc

FEROX

MEA TECHNOLOGIES INC.
CANADIAN DISTRIBUTOR

P.O Box 32030
Stonechurch Postal Outlet
1070 Stonechurch Rd. E.
Hamilton, Ontario L8W 3L3
Tel. (905) 575-8626
Fax (905) 575-8046

DATE: APRIL 8, 1996

REPORT TO: MR. C. GUTHRO
MANAGER OF FLEET SERVICES

FROM: B. DOCHERTY, V/P MEA TECHNOLOGIES/FEROX

SUBJECT: TEST RESULTS OF FEROX ENVIRONMENTAL FUEL CATALYST

Dear: Mr. Guthro

We are very pleased to submit to you the results of the controlled testing that was conducted at Traffic Dept. in order to verify significant reductions of polluting emissions and particulate smoke by the use of the FEROX combustion catalyst.

As you will recall, FEROX technology is based on the catalytic effects of organo metallics. This technology was originally developed by Parish Chemical under contract for the U.S Military and U.S. aerospace industry. In a FEROX treated environment the surfaces of the fuel particles and deposits are modified such that the catalyst lowers the energy of activation of the modified surfaces. The modified surfaces can then burn at a much lower temperature.

A typical engine develops a temperature gradient ranging from 200 Celsius at the combustion chamber wall, to 1200 Celsius at the centre of the combustion process. Many of the fuel components require a temperature greater than 600 Celsius to combust. The heavy fuel components that are exposed only to the 200-600 Celsius range never fully burn and are what contribute to deposit formation, particulate smoke, polluting emissions and other undesirable combustion side effects.

The FEROX modified surfaces and fuel particles begin to combust at temperatures as low as 200 Celsius. This is often below the surface temperature of exposed fuel particles and deposits even at the combustion chamber wall. This allows FEROX treated fuel and modified surfaces to now burn over the entire temperature range to which they will be exposed. The results are more complete combustion and eventual complete removal of all engine deposits as well as the inhibition of new deposit growth.

But most important is that FEROX dramatically reduces polluting emissions and particulate smoke. Fleet Services has demonstrated a sincere commitment to improving the harmful emissions and particulate smoke to the environment, and it was our company's goal to help you meet this objective.

TEST BACKGROUND

In October/94, it was agreed that a variety of vehicles would be subjected to a series of baseline emission and particulate smoke tests. This testing would be conducted at Mohawk College (Fennell Campus/Automotive Dept.) using both their Snap-On and Bear four gas analyzers. The test group (Traffic Dept.) would then begin using FEROX treated fuel for a period of approx. 1 year. After which time , the test and control (non-treated) vehicles would be returned to Mohawk College for final smoke and emissions testing to determine any changes from the original measurements.

The format that was agreed upon in order to demonstrate the performance of FEROX is as follows.

Three sets of matched vehicles were chosen. Of the six vehicles selected, 3 would be treated (test group) while the other 3 would be untreated (control group). Here is a breakdown of the vehicles tested.

TREATED

1. Unit # 6010 (aerial truck F700, diesel)
2. Unit # 6015 (1 ton diesel pick-up)
3. Unit # 6099 (1/2 ton pick-up, gas)

UNTREATED

1. Unit # 6016 (aerial truck F700, diesel)
2. Unit # 6013 (1 ton diesel pick-up)
3. Unit # 6097 (1/2 ton gas pick-up)

FINAL RESULTS OF TREATED VEHICLES

After accumulating 15 months of driving, the following observations and measurements were compiled after final testing at Mohawk College in Feb/96. Since 2 four gas analyzers were used, the results shown are an average reading of the two machines.

1. Unit # 6010 (treated) had shown a **30% reduction** in unburned hydrocarbons, a **17.2% reduction** in carbon monoxide emissions and **95% reduction** in particulate smoke.

2. Unit # 6015 (treated) had shown a **33% reduction** in unburned hydrocarbons, and a **20% reduction** in carbon monoxide emissions.

3. Unit # 6099 had shown a **11% decrease** in carbon monoxide emissions. (Note: unburned hydrocarbon readings were inconclusive as one of the 4 gas analyzers began experiencing technical problems at this point of the test. CO readings were steady but HC readings were not). Inspection of the exhaust flange that was installed prior to test indicated only a small amount of exhaust particulate as compared to a large amount still present in untreated matched Unit # 6097. Noted by Al Fletcher and myself.

FINAL RESULTS OF UNTREATED VEHICLES

It would be a natural assumption that these untreated vehicles would show virtually no changes from their original emission measurements. However, there were decreases in both HC and CO readings which were cause for some concern by myself. After an investigation into this matter it was discovered that Units # 6016 and 6013 had been sometimes fuelling from the FEROX treated tanks at Traffic Dept. when they were not supposed to. In the case of Unit # 6016 during the course of the test, 40% of the fuel consumed was FEROX treated. In the case of Unit # 6013, 35% of the fuel consumed was FEROX treated. This accurately explains why there were reductions in this group.

1. Unit # 6016 had shown a **10.4% decrease** in unburned hydrocarbons, a **15.5% decrease** in carbon monoxide emissions plus the presence of particulate smoke was dramatically shown in the particulate filter trap. This indicated that FEROX was just starting to soften and remove the deposits. A comparison with the particulate filter from matched Unit # 6010 reflects these results.

2. Unit # 6013 had shown a **40% decrease** in unburned hydrocarbons and a **20% reduction** in carbon monoxide emissions.

3. Unit # 6097 had shown a 24% decrease in unburned hydrocarbons and a 7% increase in carbon monoxide emissions. Inspection after the removal of the flange in the exhaust system dramatically showed the presence of large amounts of exhaust particulate. Al Fletcher and myself observed this and compared it to the much smaller amount that was present in matched treated Unit # 6099.

CONCLUSIONS

The results of testing conducted for the City of Hamilton Fleet Services positively confirms that the addition of the FEROX FUEL CATALYST dramatically reduced the harmful polluting emissions and particulate smoke in the vehicles that were treated. In respect to reductions in fuel consumption, it should be noted that scientific evidence proves that reductions in unburned hydrocarbons

effectively relates to reductions in fuel consumption. Since fuel is a hydrocarbon, unburned hydrocarbons are a measurement of unburned fuel. Therefore if the fuel is being more completely and efficiently combusted, it means that less fuel is required than was previously required.

In closing we would like to thank you for allowing us the opportunity to demonstrate the benefits of our product on your fleet and trust that we have positively shown the City of Hamilton Fleet Services a technology which will allow you to meet your criteria of reducing harmful emissions and smoke.

Sincerely,

Brian Docherty
V/P, MEA Technologies

1101 DIESEL VEHICLE INSPECTION REPORT0

Overall Test Results: PASSED HEAVY DUTYF

This document must remain in the vehicle. it may NOT be used to register the vehicle.

Test Date: 02/02/2009	Test Time: 10:39	Version Number: SL105
Test Type: Initial	I/M Status: PASSED SD002Z9847	I/M Cost: $27.00
Last Name: HENDRICKS	License Number: 143601	Engine Hp: 470
First Name:	Vehicle ID Number: 2HSFHAMR9VC0Z8856	Cylinders: 6
Address:	Vehicle Make: INTRL	Odometer: 205585
City:	Vehicle Year: 1997	Turbo: Y
Zip Code:	Model: CON 8X2	
County: Salt Lake	GVWR: 50000	

OPACITY TEST RESULTS

Snap #	Opacity %	Rpm	Stack	Legal Limit
1	5.70	0	5"	70%
2	5.40	0		
3	5.60	0		
AVERAGE	5.0			

Mechanic Number: UX001710 Mechanic Name: Green Todays Date: 02/02/2009

1101 DIESEL VEHICLE INSPECTION REPORT@

Overall Test Results: PASSED HEAVY DUTYF

This document must remain in the vehicle. It may NOT be used to register the vehicle.

Test Date: 01/29/2009	Test Time: 12:29	Version Number: SLI05
Test Type: Initial	I/M Status: PASSED SD00229836	I/M Cost: $27.00
Last Name: HENDRICK TRANS	License Number: 143601	Engine Hp: 475
First Name:	Vehicle ID Number: 2HSFHAMR9VC028856	Cylinders: 6
Address:	Vehicle Make: INTRL	Odometer: 204873
City:	Vehicle Year: 1997	Turbo: Y
Zip Code:	Model: CON 8X2	
County: Salt Lake	GVWR: 50000	

OPACITY TEST RESULTS

Snap #	Opacity %	Rpm	Stack	Legal Limit
1	8.10	0	5"	70%
2	8.10	0		
3	7.60	0		
AVERAGE	7.0			

Donald A Gunn