

Ministry for the Environment

Waste Minimisation Fund project – “Waste Oil Alternative Fuels”

## **Introduction**

Since 2006 the Wellington Institute of Technology (WelTec) has provided support to a number of research and development entities which have been undertaking projects in the area of alternative fuels.

This was an area of research and development of interest to WelTec as the training of Automotive Technicians is a significant part of our extensive trade training portfolio and with this comes an interest in what form future vehicles may take and the propulsion systems they will use.

Through working with these Research and Development entities and engagement with and support from the Hutt City Council through a joint waste assessment and minimisation project known as Silver Lining, WelTec became aware of the issues associated with the collecting and disposal of small dispersed amounts of waste lubrication oils [ULO].

Because of the dangers ULOs pose to New Zealand's underground water and above ground water systems such as streams, rivers and lakes through the effect even a small amount of waste oil has on entering any of these water systems by potentially rendering these water sources unusable as drinking / potable water for years, an application was made to the Waste Minimisation Fund for funding to support a project into the collection and recycling / re-use of these small dispersed quantities of ULOs.

WelTec's School of Engineering Technology offers a Water and Waste speciality for the Bachelor of Engineering Technology and is launching a new Graduate Diploma in Engineering with a Water and Waste Major in 2015. This project makes a positive contribution to WelTec's R&D activities being undertaken by staff and students within this specialist area.

## **The Project**

The researchers set out to determine whether Waste Oil Alternative Fuels were:

- An economic, practical and sustainable methodology that could be utilised to drive the capture of significantly larger amounts of these small dispersed quantities of waste ULOs
- An option that would allow this collected ULO to be re-processed into a usable fuel that could be used in unmodified diesel engines and generators as close as possible to its point of collection thereby minimising the contamination risk involved when bulked up amounts of ULO are transported for recycling or disposal.

## **Activities Undertaken**

The expectation had been that it would be relatively straight forward to create a collection system which would allow individuals to safely and effectively re-cycle these small quantities of waste lube oil,

The team spoke to a number of commercial entities about their involvement in such a collection /re-cycling scheme, but it became very obvious that without a means of generating a return to the commercial entity for establishing and running such a facility, the chances of establishing a long term hazard free and sustainable system were not promising.

As a result of these findings and the fact that the failure to establish such a collection system would cause significant delays in achieving the goals the team had set itself in the Project Proposal in respect to the capture and re-cycling of such ULOs, the R&D team determined that it should focus on two activities.

These were:

- To investigate existing methods used to collect small dispersed quantities of waste lube oil [ULO] and identify ways that WelTec might make a positive contribution to improve current practice.
- To ensure that a new process developed by one of the R&D entities WelTec was supporting was tested against a recognised standard to ensure that it could produce customised / blended fuels that included a % of ULO which could safely be run in an unmodified diesel engine or generator.

### **( 1 ) Current collection methods for small dispersed quantities of ULO**

The investigation into how small dispersed quantities of waste lube oil [ULO] were currently collected, showed a wide range of approaches being used, but of particular concern were the type of collection facilities where individuals could drop off quantities of waste oil which was brought to the sites in a wide range of containers.

The ULO in these containers were often then emptied into a bulk storage tank by the individuals themselves without supervision, which immediately increases the hazards posed by this environmentally damaging substance

In small amounts ULO poses a problem, but when bulked up in one place the risk it presents increases exponentially.

Photos of some current collection sites





### **Outcome of Activity 1**

As a result of the findings of this investigation, there was a clear need for the development of a standardised collection unit which would allow the safe collection, storage and initial processing of these small batch quantities of ULO.

Working with an oil industry expert, WelTec has developed a concept for a unit which would allow all the above criteria plus all current environmental and health and safety regulations' currently in place to be met.

WelTec is happy to provide the concept drawings for this ULO collection unit to interested parties.

### **( 2 ) Testing of a blended fuel using 5% ULO**

This activity set out to ensure that a new process developed by one of the R&D entities WelTec was supporting was tested against a recognised standard to ensure that it could produce customised / blended fuels that included a % of ULO could safely be run in an unmodified diesel engine and / or generator.

It had initially been decided to run a vehicle for a period of six months on a customised / blended fuel produced using the Smart Mix process which had been developed.

Instead it was later determined that an alternative method which would test the fuel produced by the process in an engine under the conditions set by the Engine Manufacturers' Association would be a more preferable approach as this would allow replication of the test with this fuel and other fuels as they were developed.

Using the Engine Manufacturers Association's 200 Hour Test protocols a new engine was run on a blended fuel which had a 5% ULO content.

### **Outcome of Activity 2**

The independently verified results were that after careful analysis of the dynamometer data and the engine measurements and visual condition, it can be concluded that there is no significant "wear and tear" on the test engine as a result of undergoing the EMA 200 hour test using the alternative blended fuel.

## **Future Activities**

Following the successful testing of a blended fuel produced by using the Smart Mix Process the R&D entity is in the process of commercialising the technology and discussions are being held with possible early adopters both in New Zealand and Internationally.

The successful completion of any one of these discussions would allow WeITec to consider undertaking the detailed design of the Standardised ULO Collection Unit so that one could be built and deployed on-site at the first user's facility.

This would then allow a collection programme in the surrounding community to be initiated which would be measured overtime to establish how successful it is, thereby fulfilling one of the original objectives set in the Project Proposal submitted.

The Research and Development entity will also be continuing its long term programme as it has been found that the Smart Mix Process appears to be able to produce blended stable and engine safe fuels using not only ULO but also other types of waste oils and bio-fuels.

At least one overseas University and a Research Unit have approached the R&D entity to discuss future joint research, something that will provide additional benefits to New Zealand.