In today’s challenging market environment requires power companies to continuously drive down operating costs and get the most out of their equipment. Shell FuelOil Plus has been developed to help in the following ways:

**YOUR DEMAND**

**HOW SHELL FUELOIL PLUS BENEFITS YOU:**

- Lower operating cost
  - Less wasted energy (Figure 1) due to better fuel stability resulting in waste volume and sludge management (Figure 1).
  - Ability to reduce latent heat (Figure 1) by enabling more effective combustion.
- Reduced particulate emissions, black smoke and soot emissions
  - Soot particles reduce the amount of smoke and particulate matter emitted (Figure 2).
- Reduced maintenance, increased operating hours
  - Lower operating costs (Figure 1).

**WHAT OUR CUSTOMERS SAY**

“Panay Power Plant 1 realised significant savings by shifting from 2% Sulphur Fuel Oil to Shell 3%S Fuel Oil Plus in May 2012. Aside from the savings on unit cost per litre of the product, we experienced no recurrence of valve guttering, which had been one of the premises for shifting from 3%S to 2%S Fuel Oil in 2009. The combination of improved combustion characteristics and higher density of Shell FuelOil Plus relative to 2% FO enabled us to generate volume savings of approximately 6.5%.*”

Engr. Petronilo ‘Nilo’ R. Madrid, First Vice President-Panay Operations, Global Business Power Holdings Inc

*The 6.5% savings are contributed by a combination of higher fuel density and the formulation in Shell FuelOil Plus. Therefore the savings may not be the same if the fuel density in regular fuel oil is similar to the density in Shell FuelOil Plus.

The above views are those of a real Shell customer who has used Shell FuelOil Plus and may have been edited for brevity or clarity. The customer was not paid for his/her testimonial. Results were self-reported by the customer and have not been individually verified. Results are not indicative of future performance; individual savings may vary with the type and operating condition of the engine and are based on the specific conditions at the customer location.

**THE HEART OF YOUR BUSINESS**

The engine is at the heart of your power plant. Keeping the engine and associated systems in optimum condition is essential for your overall business performance. Shell FuelOil Plus can be your partner in helping to improve and maintain the reliability and efficiency of your equipment.

**CUSTOMER EXPERIENCE AND SHELL RESEARCH**

**POWER PLANTS IN THE PHILIPPINES**

- **Wärtsilä 8L46**
  - Diesel engine
  - Improved reliability
  - Cleaner exhaust emissions
- **AVL/Caterpillar 1Y540**
  - Diesel engine
  - Improved reliability

**Power plant in the Philippines**

- **Source**
- **Type of equipment**
- **Benefits achieved with Shell FuelOil Plus**

<table>
<thead>
<tr>
<th>Source</th>
<th>Type of equipment</th>
<th>Benefits achieved with Shell FuelOil Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power plant</td>
<td>Wheels R45</td>
<td>1% fuel efficiency benefit</td>
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<tr>
<td></td>
<td>double-acting engine</td>
<td>Cleaner soot by 15% reduction in weight of sludge</td>
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<tr>
<td></td>
<td></td>
<td>Keeps turbocharger clean (lower speeds)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Keeps engine clean (fuel injector, inlet and exhaust valve, cylinder head, piston crown)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less soot emissions (reduced soot blowing time and fire flies)</td>
</tr>
</tbody>
</table>

**Wärtsilä 8L46 & AVL/Caterpillar 1Y540**

- Cleaner intake and exhaust valves compared with regular fuel oil
- Close to 30% reduction in particulates
- Fuel efficiency benefit of 0.42%

**CONTACT US NOW to find out more!**

**BRINGING FUELS INNOVATION TO POWER GENERATION**

www.shell.com/commercialfuels
MEETING THE CHALLENGES OF POWER PLANT INDUSTRY

Increasingly stringent regulations of local emissions, coupled with the need to ensure suitable power supply in an ever-changing economic environment, has prompted power plants to seek cleaner fuels and operate more reliably and efficiently. This may require additional investment—for example, to install equipment such as scrubbers to reduce emissions while running on conventional fuels or to use better quality fuels which may cost more. Shell recognises the challenges faced by power plants and has developed fuels technology designed to help operators meet the demands and requirements for the medium and long term.

SHELL FUELOIL PLUS WITH ITS ADVANCED FORMULA IS DESIGNED TO:

- Improve fuel efficiency
- Help lower particulate emissions, black smoke and reduce fire risk
- Support reduction of maintenance by:
  - Extending maintenance intervals (like to reduced deposits)
  - Improving ease of cleaning (less sticky and hard deposits)
- Help improve equipment reliability—fewer engine trips, less downtime
- Help lower CO₂ emissions

Fuel oil never burns completely in engines and over time deposits will form in the equipment. Lower quality fuels can lead to more sludge and deposits, resulting in higher levels of waste for disposal, efficiency loss, power loss (for example, unscheduled shutdowns), more frequent maintenance and reduced reliability.

To overcome these problems, Shell scientists have developed Shell FuoioL Plus for years of research and testing worldwide. Shell FuoioL Plus is designed to improve stability and provide more effective combustion, and recent engine and laboratory studies of our formulation have shown further improvements in key efficiency and ignition quality/carbon combustion characteristics compared with regular fuel oil (Figure 3).

SHELL FUELOIL PLUS BENEFITS versus REGULAR FUEL OIL

FUEL SYSTEM
- Fewer engine trips, less downtime
- Fewer deposits in the fuel system
- Less maintenance of fuel systems
- Enhanced cleanliness of exhaust gas boiler

ENGINE SYSTEM
- Better fuel stability at low and high speed
- Improved combustion, creating less sludge
- Less engine maintenance

FLUE GAS SYSTEM
- Reduced particulate matter
- Improved flame stability
- Lower fuel consumption

What makes SHELL FUELOIL PLUS special?

The unique formulation of Shell FuoioL Plus includes a dispersancy component (Figure 1) designed to reduce smoke and deposit formation in high speed engines and heat boilers, enhancing their overall reliability. Shell FuoioL Plus also has a combustion improver to help promote faster and more complete fuel combustion. Coupled with improved ignition quality (Figure 2), this can cut by up to 20% emissions, enhance engine and exhaust system to run more reliably and efficiently.

Figure 3: Better fuel stability at low and high speed formation

A turbiscan test measures the dispersancy of the asphaltene molecules in fuel oil. If the asphaltene molecules can well dispersant the dispersant, the asphaltene tends to be very dispersed and stable and will reduce sludge formation in the equipment.

Figure 4: Improved insulation and combustion quality

The Estimated Cetane Number (ECN) is an indication of the ignition quality of a fuel oil.

Shell FuoioL Plus has a higher ECN than regular fuel oil, showing that Ignition quality, which helps to improve efficiency and power.

REGULAR FUEL OIL
ECN < 22.8
SHELL FUELOIL PLUS
ECN > 24.8

Figure 5: Reduced nitric oxide emissions

In a 2,000 horse power test with a Wartsila engine in a power plant environment, with Wartsila 8L46 4-stroke diesel engines. Compared with regular fuel oil. A clean engine gives better efficiency and results in improved combustion, more reliability and less maintenance. The deposits on the injectors are also softer and easier to clean.

In this field trial, fuel efficiency was improved by about 1% with Shell FuoioL Plus in comparison to regular fuel oil. On converting back to the regular fuel oil, the fuel consumption was found to increase again.

Figure 6: Improved cleanliness of exhaust gas boiler

Figure 7: Reduced particulate matter

In the field trial, fuel efficiency was improved by about 1% with Shell FuoioL Plus in comparison to regular fuel oil. On converting back to the regular fuel oil, the fuel consumption was found to increase again.

In a 2,000 horse power test with a Wartsila engine, with Shell FuoioL Plus the heat transfer surfaces in the exhaust gas boiler are noticeably cleaner than with regular fuel oil. The deposits also have a noticeably different appearance and are much easier to clean (not sticky and hard).

Figure 8: Reduced nitric oxide emissions due to “blowing”