

# Combusting RFO in a Commercial Boiler

## Memorial Hospital Case Study

Sustainability issues have become an important part of the supply chain for operations of all sizes. For large energy consumers, finding a solution that is both economical and sustainable is a necessity.

**Memorial Hospital**, a critical access, acute care hospital located in North Conway, New Hampshire faced the challenge of finding an alternative to No. 4 fuel oil, a heavy petroleum fuel similar to diesel. After investigating options ranging from solid biomass to compressed natural gas, Memorial Hospital turned to **Renewable Fuel Oil (RFO)** from Ensyn Fuels as the fuel that met their goals of reducing costs while improving their carbon footprint.



### RFO: A RENEWABLE SOLUTION

RFO is a renewable fuel made from biomass, usually waste streams from forest and agriculture sites. It is a 2nd generation biofuel produced from non-food related biomass feedstocks that in the past have gone unused. RFO is a sustainable fuel and emits approximately **85% fewer greenhouse gas emissions** than similar petroleum products.

RFO is carbon-rich liquid fuel that is suitable as a replacement for fuel oil in a boiler for heating applications. It can be delivered, stored and pumped to a heating boiler in similar methods as petroleum fuel oil.

RFO has many benefits beyond sustainability. The price of RFO is based on biomass costs, which are much more steady than petroleum. This allows long-term **forecasting of heating costs** for budgeting purposes. Multi-year contracts can be signed to gain fuel price stability without overpaying.

RFO is produced from a technology with over 30 years of commercial history. With 7 production facilities in North America, RFO is tested for quality standards that meet ASTM D7544. RFO is a consistent burning, reliable fuel for any heating system.

### BENEFITS OF USING RFO

- Cost-competitive with petroleum fuels
- Long-term stable price for budget forecasting
- Made from sustainable, renewable Biomass residuals
- Storable and pumpable liquid similar to petroleum fuels
- Clean burning fuel without the sulfur and particulates from petroleum fuels
- Low greenhouse gas emissions

### IMPLEMENTING RFO

RFO fuel differs from petroleum fuel because it is made from biomass. RFO has a slightly acidic nature that requires modest changes to the fuel system, mainly in the pre-combustion section. The fuel train must be constructed of stainless steel, but in most cases, RFO can utilize the existing post combustion boiler equipment.

At Memorial Hospital, a 15,000 gallon above ground storage tank was installed for fuel storage. This tank has small space footprint and fits strategically into the facilities section of the hospital.

A separate stainless steel fuel circulation system was installed for the circulation and delivery of RFO to the burners. Due to space limitations at Memorial Hospital, the pump system was built on-site, but is usually provided as a standard skid mounted system.



RFO Pump and Heat Exchangers

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**BOILER, BURNER AND FLUE GASES**

RFO is a clean burning fuel, with very little sulfur or particulates in the fuel so it doesn't require changing the flue gas equipment. Minor modifications will be required of the boiler burner and feed system, but usually the costs of these changes are easily recouped from the overall fuel savings.

In most cases, a boiler that burns fuel oil, natural gas or propane can be converted to burn RFO. For the installation at Memorial Hospital, Cleaver Brooks designed a drop-in burner that fit seamlessly with the boiler. This burner is capable of burning both RFO and #4 fuel oil giving Memorial Hospital a fuel redundancy that did not exist prior to the conversion to RFO.



The Dual-Fuel Burner that can Burn both RFO and #4 Oil

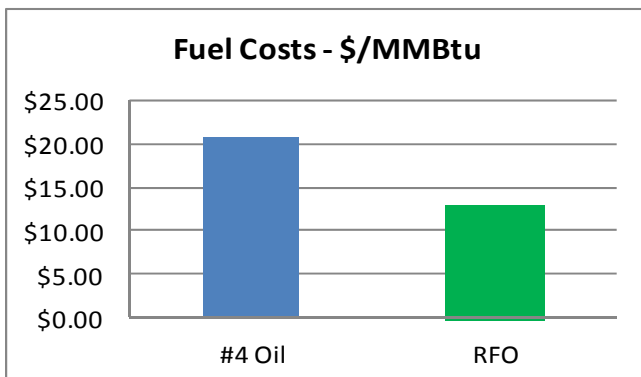


15,000 gallon storage tank

**COST SAVINGS**

During the 2013-14 heating season, Memorial Hospital burned approximately 140,000 gallons of #4 oil. Using RFO in 2014-15, Memorial is saving approximately **37% over the cost of #4 fuel oil** during the heating season.

In addition to the savings, RFO pricing is more stable since it is more closely linked to biomass pricing. This fuel price stability provides Memorial a higher degree of budget forecasting certainty. The cost for the modest equipment conversions is captured in the price of the RFO, so savings are realized with **no capital expenditure required** from Memorial.



**COMBUSTION EMISSIONS**

RFO is made from renewable biomass that consumed carbon dioxide (CO<sub>2</sub>) during its growing cycle. When burned, these same emissions are released resulting in zero net emissions and is considered CO<sub>2</sub> neutral. Compared to fossil fuel oil in burner applications, RFO reduces total greenhouse gases by over 85%.

At Memorial Hospital, the gross measured emissions will be reduced by 68% which also means that the emissions taxes paid to the State of New Hampshire will also be reduced by 68%. The majority of the reduction in emissions comes from the reduction in SO<sub>2</sub>.

