PROJECT DESCRIPTION

INTRODUCTION

Every greenhouse in the Kingsville area has a boiler plant to supply heat to the facility. The boiler plants to be built by REMASCO are no different. Essentially the boilers are housed in structures that are separated from the greenhouse areas. Like the greenhouses, they have concrete floors. Unlike the greenhouses, the structures housing the boilers are not heated, are not enclosed with glass and, generally have a lower roof height than the peak of the surrounding greenhouses. The fuel used in the other boiler plants can vary from wood, to coal, to bunker oil but natural gas is the preferred fuel if the price of the gas is appropriate. Other than gas fired boilers, all other facilities must provide fuel storage facilities on site. Coal piles, wood piles, or oil tanks are typically utilized. Wood stored outside the building is typically placed into open piles, or in areas surrounded by berms to contain the materials. Coal is typically stored in storage bins or silos. REMASCO facilities utilize vertical fuel storage silos. The flue gases from all boilers are exhausted through stacks to the atmosphere. The configuration of these stacks varies by facility, however, conventional boiler plants have no air pollution control facilities to clean the gas being exhausted from the boilers. The REMASCO facilities will be equipped with systems that will inject reagents into the gas stream to assist with the control and removal of various contaminants and fabric filter particulate control devices to remove contaminants and reaction products from the gases before they are released to the atmosphere through stacks that will be at least 65 feet above grade.

This project description outlines:

- the activities that will be required to install the gasifiers, boilers, steam turbine, and air pollution control systems at the various sites;
- the nature of the gasifiers, their operation, emission control systems and anticipated releases to the atmosphere during the operation; and,
- the steps that would be taken in the future should the gasifiers need to be retired from service.

Included are descriptions of the buildings that will house the equipment, and their construction.

SITE LOCATIONS AND EQUIPMENT LIST

The proponent will be seeking approval for gasifier installations at two greenhouse sites in the Kingsville area:

- Southshore, 1746 Seacliff Drive E, Kingsville, N9Y 2M6; and,
- Agriville, 1600 Kratz Road, Kingsville, N9Y 0A1.

The Southshore facility and adjacent greenhouses (Mucci farms and the 10 acres on the south side of Seacliff Dr.) currently cover 52 acres. Plans are in place to expand these facilities by 60 acres before the end of 2012. The main Southshore greenhouse is currently heated by two REMASCO gasifiers

with a total installed capacity of 800 boiler horsepower supplemented by a combination of natural gas and oil fired boilers. Typically greenhouse heating systems in the Kingsville area are sized for 30 boiler HP per acre. When expanded to 112 acres approximately 3,300 boiler HP of REMASCO gasification capacity will be needed to meet the peak demand, even with an expanded heat storage system similar to the current facility. The electrical requirement of the greenhouses is approximately 10 kW per acre consistently throughout the year so the greenhouses at Southshore will require 1.2 MWe. The gasifiers consume approximately 100 kWe of electricity per boiler so 7 boilers will require 0.7 MWe. In the co-generation mode three 500 HP high pressure boilers/gasifiers will be required to provide the electrical needs of the complex, 2 MWe. A total of four high pressure units will be installed in a new 30 m by 60 m building to be constructed north of the existing REMASCO boiler house. The fourth boiler will provide back-up to the high pressure steam supply system, thereby allowing a unit to be taken off line without reducing the amount of power being produced. The fourth boiler will also provide thermal energy to meet the peak heating needs of the facility. The exhaust from pairs of boilers in the new building will be combined and exhausted through fabric filter particulate control device, an induced draft fan, and a stack. Each fabric filter installation will measure approximately 5.5 m in diameter and will be installed outside the building. The two fabric filters and two stacks will be constructed adjacent to the new boiler building. The existing REMASCO boiler plant will accommodate an additional 500 HP low pressure boiler without any need to change the building footprint. This installation will bring the total capacity of the lower pressure gasifiers/boilers on site to 1,300 HP. Expansion of the boiler capacity in the existing REMASCO boiler house will require that the fabric filter associated with that facility be upgraded to absorb the flow of the new unit. As such, that unit will similar in size to those planned for the new boiler house. The two existing fuel storage silos on the site will be augmented by two new silos of similar size located next the existing ones. The storage silos will be interconnected to serve all 7 gasifiers that willl be installed on the site.

At the Agriville site, the greenhouses currently cover 40 acres. Plans are in place to expand these facilities by 20 acres before the end of 2012. The Agriville facility is currently heated by wood fired boilers that deliver 1,200 HP at peak load. These are connected to the hot water heat storage system. The wood fired boilers require high maintenance. Consuming wood to heat the greenhouses has several drawbacks. Wood supplies are limited, and the volume of wood required means that an outside storage area of 0.6 acres as well as inside storage area that measures 50 m by 30 m is required to contain and handle the fuel. The need to store wood outside precludes approximately 5 acres of land on the site from being converted to greenhouse thus lowering the overall efficiency of the site. The expanded size of the greenhouses will bring to total projected thermal heating needs for the site to 1,800 HP. Reducing the area required for fuel storage, lowering maintenance costs and raising performance efficiencies, can be achieved by installing four 500 HP low pressure gasifiers/boilers matched to 2 air pollution control trains and stacks similar to those discussed above. The current plan is to install the gasifiers/boilers in the existing buildings that house the wood boilers and the inside wood chip handling equipment. Pellets will be stored in 4 new silos that will be erected adjacent to the boiler building.

CONSTRUCTION

Agriville

The space necessary to house the gasifiers and boilers at the Agriville site is currently erected. Modifications will be required inside the building to accommodate the new gasifiers/boilers, fuel and ash handling equipment. The new air pollution control systems and the new fuel storage silos will need to be erected outside the facility. Construction outside the buildings will require minor excavation to install the footings for the equipment and concrete pads below the silos, the fabric filter baghouses and the stacks.

The areas where the pads will be constructed are currently used as traffic routes and outside storage areas for the Agriville operation. The fabric filters will require two pads each measuring approximately 7 m square. The silos are approximately 16 m in diameter and 17 m high. A truck unloading area, suitable for handling a tractor trailer combination and sheltering the unloading operation from the elements will be constructed along side the silos. Overall the fuel storage silo pad will measure approximately 40 m square with the adjacent truck unloading area being an additional 8 m wide and extending the length of the silo pad.

Southshore

The existing REMASCO gasifier/boiler house measures 34 m by 31 m and has sufficient space to house 3 gasifier/boiler units, the two existing 400 hp boilers and a new 500 hp low pressure boiler. The existing installation includes two existing baghouses and a stack that takes the flow from the two baghouses. There are two existing fuel storage silos with a covered truck unloading area. No work will be required on the existing building, however the existing baghouses will be supplemented with a third, larger baghouse which will be sized to accommodate 120% of the anticipated flow from the 500 hp third unit. The new baghouse will be over-sized to reduce the loads on the two existing baghouses. Experience suggests that these units are currently restricting the capacity the existing gasifiers. The three baghouses will manage the flow from the boilers when they are producing a total of 1300 hp. A new stack will be erected to accommodate the expanded flow. These elements will be located close to where the existing systems are located.

A new REMASCO boiler building on the Southshore site will be constructed to house four 500 hp high pressure gasifier/boiler units and the power island that will consist of steam turbine/generator combination. The new building will be similar in construction to the existing REMASCO building, steel frame construction with steel siding built on a concrete pad with a minimal slope on the roof. Construction will involve excavating to accommodate footings for the building walls and the based for a poured concrete floor slab that will support all the equipment. The turbine/generator will be built on a pedestal that will be isolated from the rest of the building. After the slab has cured the columns are installed, the purlins added to space between the columns and the siding is installed. The roof is installed in a similar manner with the joists being installed on the top of the columns, the

perlins added and the roof deck fastened to the structure. Inside the building, the gasifier/boilers, the power island and the control room will be separated by concrete block walls.

The new boiler building will be equipped with a shower/washroom for the staff and water will be directed to the sanitary sewers that serve the site. Rainwater collected from the roof of the building will be diverted to the existing rainwater handling system operating on the site.

Outside the building, two new fabric filter baghouses and stacks will be constructed. Each will serve a pair of the gasifiers. They will be located adjacent to the boiler end of the facility, relatively close to each other. Fuel for the new boilers will be stored in silos similar to those currently located on site. It is anticipated that the new silos will be located adjacent to the existing silos, possibly on the north side of the truck unloading area so the various silos can be loaded from one unloading system. As with the silos at Agriville, a concrete pad will be built to support the silos and their contents. The pad for the silos will be approximately 20 m by 40 m in size.

Similar to the construction activities for other slabs and footings, some excavation will be required to install foundations followed by pouring equipment supports and the concrete support slabs.

Duration of Construction

It is anticipated that construction and commissioning of the equipment in the various facilities outlined above can be completed in 18 months from the time that permission is received.

Work Force Required

During the construction period approximately 15 man years of work will be required.

Equipment Descriptions

The preceding sections suggest that the equipment list at the various sites will be very similar. The components included in the equipment installed at any site can be divided by function:

1. Fuel Storage and Handling;
2. Gasifiers and Boilers;
3. Residue Handling Systems;
4. Air Pollution Control Systems;
5. Control and Monitoring Equipment; and,
6. Steam Turbine and Electricity Generator.

The seven gasifier/boiler units that will be situated at Southshore are virtually identical with the exception that the two existing gasifiers are smaller, 400 HP versus the 500 HP units that will be installed in the future. The four boilers in the power house will be high pressure steam generators with superheaters, as opposed to the low pressure steam systems installed at the other locations. The

Air Pollution Control systems will be similar, with the two systems at Agriville and the two systems associated with the power house being identical. Of the three baghouses that will eventually be installed at the Southshore boiler house one will be the same design as those at the power house and Agriville, but the two existing units are smaller as they were each sized for a 400hp gasifier. The power island, steam turbine and electricity generator will be unique to the power plant portion of the installation and, because these components add more complexity to the facilities, the controls associated with the turbine generator will be unique compared to the other boiler houses.

The individual components of the systems are described below with differences between the installations being identified as appropriate. This approach provides the reader with an understanding of how the components are employed in the system, but avoids the redundancy of describing all the components in each of the three installations separately.

Fuel Storage and Handling

Pellets shipped to REMASCO are transported in walking floor trailers. At site the trailer is unloaded into a storage silos adjacent to the boiler house. As noted elsewhere there are two silos associated with the existing REMASCO boiler house, see Figure 1. Two more silos will be added at the Southshore site and 4 silos will be installed at the Agriville site. These silos are typical of the type of equipment used to store various materials at agricultural facilities.

Each silo holds approximately 1,200 Mg of pellets (48 ft diameter x 54 ft peak x 35 lbs/ft3 / 2205 lbs/tonne). Upon arrival at site, the trailer will be driven over an unloading pit. Pellets will be transported from the pit to the silos using a 110 ft high bucket elevator. At the head of the bucket elevator pellets can be diverted to the appropriate storage silo. Materials will move through the silos on a first in first out basis suggesting that one silo will be emptied as the other is being filled and when the second silo is full, fresh pellets will be diverted to the partially empty silo. Each silo is capable of holding sufficient pellets for approximately 48 gasifier days of operation at full load.

The existing pellet transport system moves pellets from the bottom of the active silo to an intermediate day hopper mounted near the roof of the building. This hopper feeds the fuel metering bin hoppers on top of each gasifier. The existing roof bin stores approximately 7 m^3 or 8 Mg of pellets, thereby requiring refilling every 4-6 hours to supply two 400 hp gasifiers. The roof bin buffers the material flow from the storage silos to the gasifier metering bins minimising the wear and tear on the bucket elevator by reducing the need to constantly start and stop to replenish the metering bins on the gasifiers. The metering bin hoppers on the gasifiers hold approximately 1 m^3 or 500 kg of pellets and regulate the feed of pellets to the gasifier.

On start up or shutdown of a unit the feed system can operate with the roof bin empty and its bottom slide-gate open to allow different fuels to be fed to the metering bins on different units. In this case, each metering bin calls for its fuel directly from the source fuel bin and the bucket elevator operates each time a metering bin is calling for fuel. The control of this system is governed by level controls on the metering hoppers.

Figure 1 Fuel Storage Siloes at Southshore Greenhouses with Covered Truck Unloading to the Right

The metering bins are equipped with a rotary airlock at the bottom of the bin. This rotary air lock transfers fuel from the bottom of the metering bin and drops it directly onto the chain grate of the gasifier. The speed of the rotary airlock is controlled and synchronized with the speed of the grate.

Solid Fuel Gasifier/Boiler Installation

The REMASCO solid fuel systems are basically biomass gasifiers that are connected to a heat recovery boiler to produce the hot water or steam at a pressure required for downstream equipment. Low pressure steam can be used for process heating, or high pressure steam can be used to drive a steam turbine to generate electricity. The principal source of fuel for the gasifier, will be ENERPAX pellets, although waste wood pellets or wood chips are used during start-up and shut down of the units and can be substituted for the Enerpax pellets if necessary.

A REMASCO Commercial Gasifier/Boiler unit will be rated at 500 HP output capacity, or 24 GJ/h input capacity. The gasifier is designed with systems to supply fuel to the bed, control how that fuel is processed and how the residues of ash are removed. Downstream of the gasifier, a boiler is used for heat recovery.

The process schematic for a commercial scale gasifier/boiler system is provided in Figure 2. Two of these systems are currently installed in the REMASCO building at Southshore.

Figure 2 Gasifier System looking towards Boiler

Gasification System

The gasifier is a refractory lined chamber with a moving grate installed in the lower portion of the chamber. The cast alloy chain grate rotates around the underfired air plenum. A water-cooled, 24" drive pulley driven by a variable speed controlled electric motor is mounted at the ash discharge end of the gasifier to move the grate at the appropriate speed.

As noted in the previous section, fuel is added to the grate from the metering bin. Once the fuel is deposited on the moving grate, it takes approximately 1.5 to 2 hours to travel through the unit. The grate does not tumble or turn the fuel, rather the air introduced into the gasifier fluidises the bed material and exposing fresh surfaces. At the feed end of the grate, fuel is added at a rate that maintains an even fuel distribution. The thickness of the bed decreases as the materials move towards the discharge end of the grate. At the end of the grate, the bed is fully consumed, containing minimal unburned material.

Large ash particles are discharged off the end of the grate conveyor, while fine ash particles, siftings, pass through the grate and are pushed along the gasifier floor into the ash sump with a light drag chain conveyor.

The ash created in the gasifier drops into a water-cooled ash sump at the end of the grate. The sump is equipped with an ash auger that discharges the ash through a rotary airlock to a covered drag chain conveyor. The rotary air lock provides the seal between the gasification process and atmosphere. The drag chain conveyor is equipped with strategically placed spray nozzles to cool the ash and minimize dust generation. The ash drag conveys the ash to a 20 m^3 lugger bin for haulage to disposal.

A combination of recirculated flue gas and fresh combustion air is blown up through the grate and fuel bed. The grate system has been designed with four independently controlled combustion zones. The first zone utilizes fresh air only while a combination of recirculated flue gas and fresh air is supplied to the balance of the zones. The mix of fresh and recirculated flue gas controls the amount of oxygen in the underfired combustion air and serves to control the temperature within the gasification chamber.

The gases produced in the gasifier chamber exit through the Mixing Chamber and Hot Gas Ducting (HGD) to the secondary combustion chamber. Secondary and tertiary combustion air is injected into this region through nozzles tangentially mounted on the ducts. This air is a mix of fresh air and recirculated flue gas to control the combustion temperature and reduce the amount of oxides of nitrogen produced in the system. Temperatures in the HGD mid-section and Secondary Chamber exhaust are measured as a control parameter for fresh air addition.

Gases entering the secondary chamber are in excess of 1,000^{O}C and remain in the secondary chamber for a minimum of 1 second prior to exiting the chamber. Gas velocity is reduced in the secondary chamber to allow large particulate matter to settle to the floor of the chamber. A mix of sodium hydroxide and water is injected into the gas leaving the secondary chamber to reduce both the gas temperature and the amount of free chlorine in the gas stream going to the boiler.

Heat Recovery

The basic single pass low pressure steam boilers installed for heat recovery at Agriville and Southshore will be manufactured by the Johnson Boiler Co. The boilers are positioned in a way that allows quick and easy access to the tubes for periodic cleaning. A positive on-line cleaning system will be installed in each boiler. This system is used to remove any ash building up on the boiler tubes thereby providing better operating conditions and reduced contaminant generation. The gas exhaust temperature from a clean boiler will be in the range of 325 - 350^{O}F and will increase by approximately 50 ^{O}F as the boiler tubes begin to foul.

Heat produced by the boiler is either sent directly to the greenhouse or to an air to water heat exchanger that heats the water to be stored in large, outdoor hot water storage tanks currently installed on the properties.

The high pressure steam boilers required for the power plant on the Southshore property will be of water tube construction complete with a superheater and economizer section for maximum recovery of energy. The gas exhaust temperature from the boiler will be in the range of 325-350^{O}F. Steam produced by the boilers will be sent to the steam turbine/generator set for conversion to electricity.

Steam Turbine and Generator (Power Island)

The power island will consist of a 50,000 lb/hr, 3 stage, 450 psi back-pressure steam turbine coupled to a 4160V, 3 phase synchronous generator. Currently the capacity of the generator will be limited to 1.8 MWe. The generator will be connected to at least two of the three greenhouse facilities, as a separate source of supply to each of their existing backup generator systems. The transfer from grid power to island power for each of the three services will be manual. This means that a brief power outage will occur during the transfer from one source of supply to another.

The turbine is referred to as a "back-pressure" unit because, unlike installations where electricity generation is the major consideration and the turbine extracts the maximum energy from the steam by discharging to a vacuum, the steam exiting the REMASCO turbine will only be brought down to 15psig. To utilize the balance of the energy in the steam, a desuperheating/pressure-reducing station will allow any unused steam to be sent directly to greenhouse heating, either through a heat exchanger or for direct use as low pressure steam.

Of the 1.8 MWe generated in the power plant, the REMASCO gasifier/boiler loads will total approximately 700kW and the greenhouses will consume approximately 10kW/acre or 1.1mW for 110 acres.

Air Emissions Abatement System

The exhaust from a pair of boilers passes to the emission control system which includes the recirculated flue gas systems and the induced draft fan that discharges gases to the stack after they go through the fabric filters. Several methods are used to control emissions from the gasifiers. Aside from good combustion control measures that ensure high organic compound destruction rates, and the use of flue gas recirculation to reduce the production of oxides of nitrogen, the main control measure is introducing various sorbents into the flue gas stream and removing the resulting reaction products in particulate control devices.

Sodium hydroxide is introduced into the secondary chamber exit to reduce the concentration of free chlorine and chlorine radicals in the gas stream entering the boiler. Lime and powdered activated carbon are introduced into the gas stream before the exhaust gases enter the fabric filter. To prevent equipment deterioration and optimize the operation of the gasifier/boiler system, the recirculated flue gas is treated and polished to the same extent as the final effluent before being mixed with fresh air to achieve the desired recirculated gas quality and before reintroduction into the gasification system.

In the existing facility, provisions have been made to inject lime and powdered activated carbon [PAC] into the duct that carries the gas stream to the fabric filter. Both reagents are injected using separate small, volumetric metering screw. The lime feed rate can be adjusted to achieve the desired outlet concentrations of HCl and SO_2. Powdered activated carbon [PAC] injection rates are typically on the order of 1 lb/hr per operating unit, sufficient to reduce mercury and PCDD/F emissions to well below the regulatory levels. Duct sorbent injection systems such as the one that is currently used have a higher reagent injection rate. By employing better mixing of the reagent with the gas stream and longer reaction times, reagent use can be optimized. To accomplish this all new systems will incorporate a spray dry absorber [SDA] ahead of the baghouse.

The spray dry absorber will utilize lime slurry to deliver the reagent to the gas stream for removal of HCl and other acid gases and PAC to remove PCDD/F and mercury. Since the reagents are injected as a slurry sufficient time must be allowed for the moisture in the slurry to evaporate into the gas stream. It is anticipated that a residence time on the order of 12 seconds will be required at the REMASCO sites. Essentially, the spray dry absorber is an enlarged section of duct where the gas velocity can be slowed and any particulate matter that is not transported with the gas stream can settle. The SDA is connected to the baghouse where the majority of the reaction products are removed.

The SDA/baghouses used at the REMASCO sites will be identical in most cases, although a slightly larger system will be required for control of the exhaust from the 1300 HP boilers installed in the existing REMASCO building on the Southshore site. The fabric filters will be modular, walk-in plenum style units designed to provide 3,300 ft^2 of filter area. With a design flow of 10,000 cfm this equates to an air to cloth ratio of 3.01:1. The filters will be standard fibreglas bags. A pulse air cleaning system is used to periodically clean the bags. The resulting APC residue, consisting mainly of spent lime and ash is expelled into an air-tight 2 m^3 or larger bin.

Gases will exit each baghouse through a 56 kW induced draft fan and be expelled through a 0.81 m diameter stack. The stack associated with the existing REMASCO boiler house will be 0.91 m diameter to maintain a similar exhaust gas velocity from the larger system. The speed of the ID fan will be variable to enable control of the draft within the primary gasification chamber.

Controls, Data Acquisition & Continuous Emission Monitoring Systems

The process control and data acquisition system for the REMASCO commercial test system is an Ethernet capable, Siemens S7-300 process controller (PLC) complete with a PC based supervisory control and data acquisition system. This system is capable of monitoring and providing long term storage for all discrete and analog process parameters measured and controlled by the PLC. Such parameters will include major equipment on/off status, all temperatures, pressures, flows and all required Continuous Emission Monitoring parameters. Two oxygen measurement systems are used for process control purposes. These sensors will be installed as permanent instruments complete with sampling probes, sample conditioning systems and daily calibration capability. Any additional

continuous gas measurements that may be deemed necessary for processing the Enerpax pellets will be installed as required.

The control system, including the PLC and SCADA PC will be protected from power surges and blackouts using an uninterruptible power supply. In addition, the South Shore Greenhouses Inc. 600VAC emergency power system will protect the entire REMASCO pilot facility from local electrical grid power failures.

Operation of REMASCO Systems

The equipment and purposes of the components of the REMASCO facilities were discussed in the previous section. The operational aspects of the facilities will be discussed in this section. The facilities will be managed by staff with experience in operating combustion systems.

It should be remembered that the facility is mechanized. The basic design of the gasifier and combustion chambers is similar to those used by other manufacturers and the pilot facilities have operated successfully over the past few years. The APC system is also standard equipment. The design and operating knowledge developed in the pilot facility and in the use of this standard equipment at other sites can be translated to the REMASCO projects.

Waste Throughput and Storage Capacity

The maximum quantity of the fuel that can be fed to the gasifier is a function of the calorific value of the material. The individual 500 HP gasifier and its associated combustion chambers have a capacity limited to a maximum input of 25 GJ/h (500 hp X 33480 BTU/hp X 1.0551 kJ/Btu / 0.7). This translates to feeding about 1085 kg/h of ENERPAX pellets to each 500 hp gasifier when it is operating at full load.

In operation, the gasifiers will not be operated at full load all the time. The high pressure boilers associated with power generation will operate year round to generate steam for the turbine, and they will supply heat to the storage system when they operate. The amount of heat provided by the high pressure boilers will be sufficient to maintain operating temperatures in the heat storage system that heats the greenhouses during the warmer months of the year. This means that the low pressure boilers will not need to operate during some months. Furthermore, since the plants in the greenhouse benefit from elevated levels of CO_2 during part of their growth cycle, the backup gas fired boilers installed in the greenhouses are run to produce heat and the CO_2 they produce is exhausted directly into the greenhouse. This reduces the load on the gasifiers. The full capacity of the gasifiers will be required at both sites during the coldest months of the year, January and February. This decreases to 27% of the full capacity in the summer months of July and August. At other times of the year the fuel feed rate will be between these extremes. For the power plant, the need for electricity occurs year round, so the gasifiers will operate at feed rates in excess of 95% for all but July and August when they will operate at an estimated 72% of full capacity. These capacity requirements will be achieved by operating various combinations of gasifiers at similar output rates. Typically the operation will be optimized so that no gasifier will operate at less than 65% of its full capacity.

While ENERPAX MSW fuel pellets are currently classified by the MoE as a waste, in that they are manufactured from residual MSW materials, they are a fuel that is dry, and reasonably odour and dust free. The production from the pellet plant is relatively constant, that is it does not vary by season, thus the variable fuel requirement for the REMASCO facilities requires that fuel be stored on site to even out supply and demand. The pellets will be stored in the silos discussed earlier. These

structures are similar to grain storage silos and provide enclosed, dry storage on a concrete pad to prevent the pellets from contaminating the local soils.

While the MoE suggest that the operating report should outline waste screening procedures and criteria that will be applied to minimize the potential for mixing incompatible materials, this is not considered a concern with the proposed facility. The DONGARA process manufactures the pellets in facility approved by the MoE. That facility removes incompatible materials and ensures the quality of the fuel pellet with rigorous quality assurance and quality control procedures. Wood used at the facility will be obtained from companies that specialise in providing wood chips and pellets for such purposes. Both of these materials are similar and completely compatible with each other.

The ash from the gasifier and residue from the APC system will create residue streams. These residues will be deposited in suitable containers to be sampled and transferred to an approved disposal site. Since the pellets are projected to have an ash content of approximately 9%, 2 gasifiers operating at full load will produce approximately 5 Mg of ash each day. This ash will be tested prior to being released for transport to an approved landfill.

Process Monitoring

ENERPAX pellets shipped to the facility will be weighed by the supplier before leaving his facility. Similarly, any wood waste pellets will be weighed before they are shipped to the facility. There will not be a weigh scale on site. Residues leaving the site will be weighed at the disposal site and that information will be collected by the operators and recorded in the facility logs.

The facility will have records of services used: electricity, gas and water supplied to the facility.

Should any complaints be received about operations at site, these will be documented and submitted to the MoE as specified in the existing Certificate of Approval. Included in these submissions will be an explanation of any measures that were taken to prevent a reoccurrence of the events that are thought to have given rise to the complaints. A description of site operations, including process and procedural limitations identified during operation and any modifications that might be made to circumvent these limitations will be documented.

Facility and Site Maintenance

A detailed maintenance program is being developed as more operating experience with the equipment is gained. The maintenance program will address two significant areas:

- Equipment maintenance; and,
- Building maintenance.

All facilities and stationary equipment will be inspected and serviced on a basis that meets or exceeds the manufacturer's recommended intervals.

The operating objectives will require:

- the immediate correction of safety problems;
- the minimization of operating downtime; and,
- the correction of all other maintenance problems within 24 hours of being identified.

All identified repairs, deficiencies, and alterations will require that a repair procedure be initiated. This will begin with the issuance of a work order and costs incurred to affect the repairs will be tracked to the completion of the work order.

Maintenance programs will be built around sound inspection schedules, and preventative maintenance schedules designed to meet or exceed the manufacturer's specifications. An important aspect of this work will be that the operations maintenance staff completing daily inspection reports.

The Preventative Maintenance program will be based upon a pre-determined schedule of services, inspections, and parts replacements.

It is proposed that an annual inspection of all facilities and equipment be completed. This inspection will include the following:

- All major structural components, including structural beams, supports, foundations, roof components, external siding, etc.
- All facility systems and sub-systems, including refractory, feeder wear, and the grate chain, baghouse and heated water and electrical distribution systems etc.

This inspection will provide a review of all records and analysis of any identified problems or deficiencies, and will produce a report that details the findings and provides recommendations for the correction of any identified problems.

Staff training

Staff training is the cornerstone to being able to carry out the maintenance and inspection programs outlined in the previous section. The purpose of training in the environmental context is to ensure that all personnel who operate equipment that has the potential to create a significant impact on the environment receive proper, adequate, and appropriate training. Personnel training programs are essential for safe working conditions and efficient operations. The training plan will be developed to ensure that the necessary training is conducted and recorded. The plan will address training for new employees to adequately prepare them to work with the REMASCO gasifier. For those with some experience working with this type of equipment training will reinforce their knowledge of safe operating practices. It must also address emergency response training as well as safety, corporate, practical, and regulatory training.

Training must address a number of different topics to ensure that employees receive a comprehensive preparation for their specific jobs. This training is conducted through various training mechanisms, and its content is dependent on the individual's job. New employees receive orientation training and in-depth training on various topics including waste processing procedures, emergency operations and the requirements of the Certificate of Approval issued by the MoE. This training will be supplemented by regular refresher training. All employees will be trained in the contingency/emergency response plan. Health and Safety program will also include:

- Standard Operating Procedures;
- Health and Safety Plan;
- A comprehensive Health and Safety Committee;
- Regular Safety Training Sessions;
- Safety Meetings; and,
- Safety Incentive Program.

Contingency plans

Regardless of the degree of supervision applied and the maintenance and inspection plans developed for the facility, some unforeseen occurrences may arise in the course of the operation. Such situations will be the subject of a comprehensive contingency plan being developed for the site. While catastrophic occurrences that could arise from major storms etc. will not be addressed in the contingency plan, more common events such as spills and fires will be covered. Inspections will ensure the maintenance of these measures.

Emergency Preparedness Training is site specific training. The Emergency Coordinator and his crew will review the various emergency procedures and practice using the onsite equipment (i.e. fire hose and nozzles, self contained breathing apparatus, fire pump maintenance, portable monitors, etc.). The emergency responders will participate in 2 training sessions per year. Fire training is incorporated into the emergency preparedness training. In addition to the site training sessions, employees will be encouraged to participate in off site training.

A project specific plan has been prepared for the existing Southshore facility. The plan deals with: fires, floods, power failures and spills. This plan will be executed with local municipal involvement and agreement to those plans has been put in place. All employees will be trained in the execution of the plan. Power failures will trigger an orderly shutdown of the gasifiers with back-up power being provided by the emergency diesel generators installed at the facility. The plan will also address fire contingencies.

Details of contingency issues are outlined in the following table.

Contingency	Response
Equipment breakdown	The equipment design is robust, having been used in this type of technology for many years, where as long as regular maintenance is performed the equipment has been shown to be reliable. In the unlikely event that a major equipment breakdown occurs that cannot be resolved within a 24 hour period, any anticipated fuel shipments to the site will be curtailed.
Fire	The site will be designed within municipal and regional guidelines related to hydrant coverage. In the case of a building fire, the fuel feed to the building will be curtailed. REMASCO have installed a continuous temperature monitoring system in the storage silos with an alarm system. The storage silos are equipped with a deluge system.
Odour, noise or air related complaints by public or staff	All complaints will be recorded by management for review by the company and/or ministry staff at any time. Appropriate action will be taken quickly to mitigate the impact of such complaints. The problem will be investigated and any required adjustments to operational procedures will be acted upon immediately, to minimize any possible future complaints.

Closure

Should the facility be unable to obtain DONGARA pellets at some time in the future, the gasification of waste on site will have to be curtailed. Since the gasifiers are capable of handling biomass materials, such as wood or some other biomass that could be converted to a form suitable for feeding to the gasifiers, steps would need to be taken to cease processing waste on site.

The gasifiers/boilers would be maintained as operating entities on the sites where they are established. The silos would be emptied of DONGARA pellets, and that fuel would be replaced by the biomass that can be used to operate the gasifiers. All bottom ash and air pollution control residues on site after the last of the pellets are consumed with be handled in the same manner as it is currently, namely sent to approved disposal facilities.

Once these steps are completed, the facility can continue to operate as a biomass gasification facility.