Dyplast products

CASE STUDY: Cedar Hills Landfill Gas Project

ISO-HT in Renewable Energy Project

The Low-Profile Cedar Hills Landfill Gas Facility near Seattle, with Mt. Rainier in the Background

The Players

Insulation Manufacturer:
Dyplast Products, LLC

Fabricator:
Bay Insulation of Washington

Insulation Contractor:
Three Rivers Custom

General Contractor:
Industrial Resources, Inc.

Facility Owner:
BioEnergy (Washington), LLC

Energy Purchaser:
Puget Sound Energy

Gas to Energy Technology:
Ingenco

Landfill Owner:
King County, Washington

Dyplast's ISO-HT

Dyplast Products, with its new ISO-HT polyiso product line designed for *high temperatures* up to 400F, was convinced its product and company responsiveness would contribute to a winning scenario in this innovative renewable energy project. Bay Insulation in Washington, an experienced fabricator within Dyplast's extensive network, added the necessary skill-set to fabricate Dyplast's polyiso "blocks" into requisite shapes and tolerances.

ISO-HT is specially formulated and independently tested to retain critical thermal efficiency, compressive strength, dimensional stability, permeability, and other performance factors at service temperatures up to 400F, far in excess of the maximum service temperature of competitive polyisocyanurate and polyurethane insulations. ISO-HT physical properties, particularly R-factor, make it highly preferable to mineral wool, fiberglass, or alternative insulations.

ISO-HT is tested by independent laboratory to meet demanding Class 1 flame spread and smoke development requirements per ASTM E84. ISO-HT is manufactured as bunstock and can be factory-cut into sheets or blocks across a wide spectrum of dimensions, with tolerances as close as 1/32 inch on surfaces.

ISO-HT Fabricated into a Hemi-cylindrical Segment, ready for installation

Project Summary

The convergence of high energy prices, global warming potential, general environmental pollution, home-grown energy imperatives, and *green* energy possibilities has created opportunities that far-sighted companies can capture and the public expects.

Thus Puget Sound Energy and BioEnergy Washington (a division of Ingenco) stepped forward in 2008 to collaborate in turning garbage into energy in the form of natural gas. The new methane conversion facility was designed to consume the entire land fill gas (LFG) from 500 gas vents at Cedar Hills while generating 4,500 standard cubic feet of methane at 800 PSI. Methane is the primary component of commercial grade natural gas which fuels generators for the production of electrical power.

The resulting methane extraction facility was not a simple undertaking, and required the integration of a range of proven technologies to overcome hurdles could have resulted in failure.

Part of the technological innovations included the *insulation system* required to accommodate the 4000 lineal feet of gas processing systems (often reaching 400F) and waste water systems, while providing maximum contribution to energy efficiencies, environmental protections, and people and process safety - - the core fundamentals of facility design. Dyplast's ISO-HT polyisocyanurate insulation was selected as the foundation of the insulation system.

Critical Insulation Specifications

To meet the objectives of the owner, the general contractor, and energy technology providers, Three Rivers Custom specified an insulation system that achieved a minimum 5.6 R-factor (0.178 K-factor); thus achieving a superlative 11.2 R-value when using 2 inch thick insulation. The insulation was also expected to meet other demanding physical properties such as compressive strength, moisture permeability, and weight; and Three Rivers Custom expected high standards for shipping, delivery, shop fabrication efficiency, and end-product tolerances for shaped insulation segments such as hemi-cylindrical sections, ells, and tees. In the end, Dyplast Products and Bay Insulation were the selected providers.

Why Dyplast ISO-HT?

ISO-HT (manufactured by Dyplast Products) was selected over competing polyiso products and other insulation alternatives for the Cedar Hills Energy Project only after balanced multi-value assessments by several parties. Key factors in the decision included:

- ISO-HT physical properties were validated by independent laboratory
- physical properties met or exceeded requirements set by ASTM C591, the governing standard for polyiso rigid foam
- ISO-HT exhibited lowest aged K-factor of competing insulations
- customized bunstock sizing provided efficient shipping logistics and scrap minimization during fabrication
- availability of high density polyiso provided options for pipe hanger applications
- ability to cut blocks to close tolerances
- flexibility and responsiveness in deliveries and technical advice enabled reduced costs, improved schedules, and enhanced relationships
- easy to handle and work in the field, with minimal breakage
- quick product turn-around and delivery

ISO-HT Polyiso Bunstock Exiting Production Tunnel at Dyplast Facilities in Miami

Mechanical Scope

The Landfill Gas process lines consist of 3 to 15 inch black iron pipe. The Waste Water System included 1-2 inch stainless steel pipe generally operating at ambient field conditions. Even though ISO-HT has a very low permeance (at 2.33 perm-inch), an additional zero perm vapor barrier was selected to prevent water vapor drive from either direction at high or low process temperatures. Where freezing temperatures or corrosion under insulation might be encountered, heat tracing was installed along with PVC jacketing.

All other insulation was encapsulated in .016 aluminum jacketing to offer protection from field abuse and damage. In combination with the 37 PSI compressive strength of ISO-HT, significant dent protection from field abuse could be achieved that was not attainable with glass fiber insulation.

Teamwork

Dyplast Products, **Bay Insulation**, **Three Rivers Custom**, and **Industrial Resources Inc**. upheld our high standards of by closely coordinating quality, just-in-time deliveries, and communication feedback to ensure that installation of the insulation system proceeded expeditiously and in sync stakeholder expectations. After contract award, the ***Team*** began the project by closely examining manufacturing cost savings, transport economies, fabrication and installation efficiencies, and possible innovations given the specific sizes, quantities, and shapes of insulation to be fabricated. Dyplast's ability to customize polyiso bunstock dimensions was clearly an advantage, since bun sizes could be matched to minimize waste as Dyplast cut the bunstock into blocks ("pipe chunks") which were, in turn, sized for minimizing waste during shape fabrication.

Fabrication

The ISO-HT polyisocyanurate insulation was fabricated into 1 and 2 inch thick pipe insulation sections by **Bay Insulation** in Kent, Washington. Bay Insulation utilizes CNC guided profile cutting equipment for high speed fabrication with tolerances within 1/8 inch. Pipe Fittings such as elbows, flanges and valves were also all fabricated through the help of Bay's custom built fitting fabrication equipment. In addition, Bay supplied all the other system components such as jacketing, strapping, vapor barrier and removable high temp blankets. Bay offered a complete line of locally stocked and fabricated insulation components for the project. Bay can produce at their site custom insulating systems and conformed shapes in virtually any size or configuration.

Erection

Industrial Resources Inc. of Clear Lake, WA was the General Contractor, with a scheduled start-up of the Landfill Gas Facility in May 2009. The President of IRI, Jay Follman, believes that energy costs and environmental issues have made insulation specifications and installation a vital site performance issue. ***"Its been a long time since I have seen any real alternatives or technology like ISO-HT as an option to conventional insulation systems."***

The entire 4,000 lineal feet of pipe insulation was installed by **Three Rivers Custom**, located in Kennewick, WA. According to President, Chad Larson, ***"The higher R-Value of ISO-HT, the custom fabrication, and the experienced installation practices of Three Rivers Custom yielded a light-weight yet thermally efficient system."*** Bulk could be minimized, allowing more efficient erection plus better access to components. Reduced insulation thickness also allowed quantities of vapor barrier and jacket material to be reduced. Lower weight resulted in fewer pipe hangars. Higher thermal resistances improved process efficiencies, lowered energy costs, and enhanced personnel safety from high temperatures.

More About Cedar Hills

Cedar Hills Landfill, King County near Seattle

The Cedar Hills Landfill in Seattle has grown to over 950 acres in its 30 years of operation in the region. During that time, Cedar Hills has had to deal with increased levels of landfill gas (LFG) like methane from over 500 gas vents across the site.

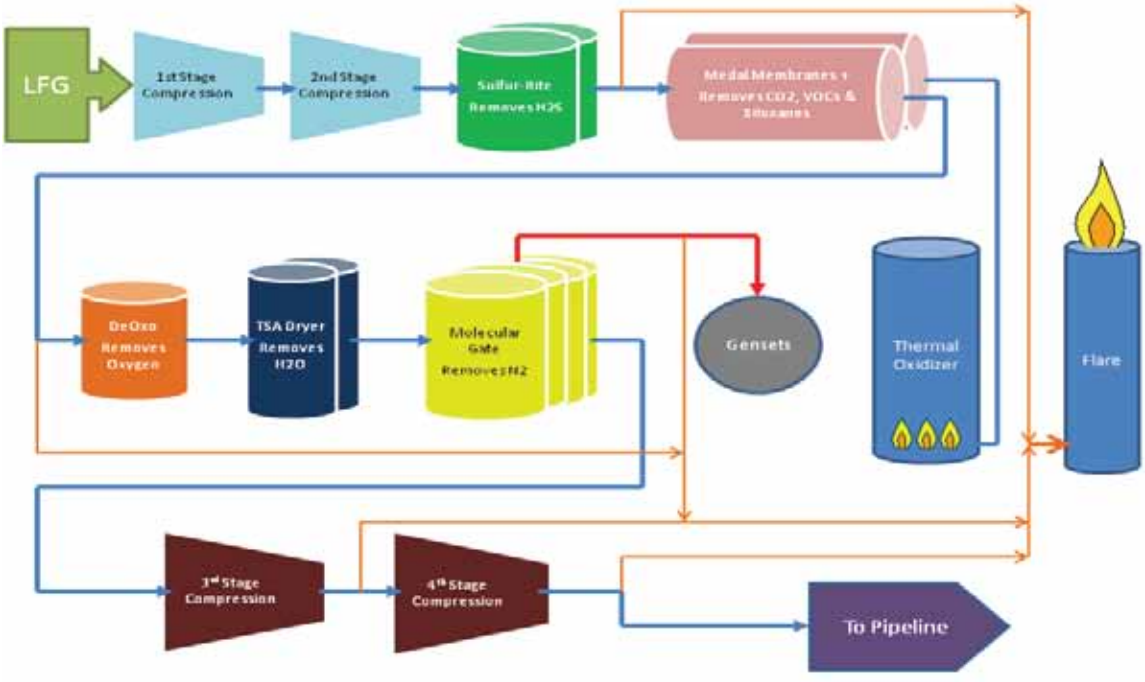
Up until 1991 the Cedar Hills Landfill managed VOC emissions and odor problems through a series of gas vents that channeled LFG emissions to the landfill surface for flare ignition. In 1991 LFG emissions were captured and pumped to a central ignition burner for a more complete combustion of gases. Although a higher percent of LFG were burned, problems with VOC emissions and odor lingered.

The solution was to capture and process the LFG into methane as a renewable energy while dramatically reducing VOC emissions and their objectionable odor to the surrounding community. Currently there are over 100 methane recovery systems operating at landfill sites in the US. These recovery systems capture and purify methane which in turn fuel generators creating electricity. The insulation of choice for the 4,000 lineal feet of pipe at Cedar Hills was Dyplast Products ISO-HT, a polyisocyanurate foam insulation designed to offer an R-value of 5.6 per inch operating in temperatures up to 400 degrees F.

The Gas-to-Energy Process

The methane extraction system includes a series of purification and gas compression steps to remove contaminates found in landfill gas (LFG). In fact, the final methane gas leaving Cedar Hills is cleaner than the natural gas found in conventional wells. According to Matthew Schneider, Process Engineer at BioEnergy, their proprietary process removes residual carbon dioxide, oxygen, water, siloxanes, VOC's, nitrogen, and hydrogen sulfide to produce a very pure grade of methane for generator combustion. These residual components are then burned in a high temperature closed combustion chamber with only CO2 and water emissions. A side stream of all lower-quality methane gas (Tails) is used to power the site's 18 gas generator sets to provide electricity for the LFG to Methane process. In fact about 45% of the site's energy needs are generated from LFG . The purified methane is transported to the adjacent Northwest Pipeline for natural gas, which in turn transports methane to natural gas fired power plants. Puget Sound Energy (PSE) will use the methane from Cedar Hills to generate an estimated 287,000 megawatt-hours of electricity annually; on average that's enough power to meet the needs of 24,000 homes in the area. BioEnergy estimates that it will process and deliver to PSE at least 4 million cubic feet of methane daily and average 5.5 million cubic feet daily over the next 20 years. All of this available energy will be produced from waste (garbage).

Cedar Hills Landfill LFG to Pipeline Gas Project Process Flow



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