SOUTHEASTERN PUBLIC SERVICE AUTHORITY

WASTE-to-ENERGY

Part of the SPSA Integrated Solid Waste Management System
RDF Plant

The Refuse Derived Fuel (RDF) Plant, owned and operated by the Southeastern Public Service Authority (SPSA), processes nearly half of the solid waste generated by southeastern Virginia residents each year into fuel. Since the facility began operation in 1988, millions tons of solid waste have been processed into fuel. The operation of the RDF Plant, one part of SPSA's waste-to-energy system, reduces dependence on fossil fuels, reduces the amount of solid waste buried in landfills and extracts energy from otherwise wasted sources.

The RDF Plant utilizes an integrated system of equipment to process solid waste into a consistent four-inch particle size.

Municipal Solid Waste (MSW) is received and unloaded from SPSA transfer trucks, city trash collection trucks, independent solid waste collection companies, and private citizens. It is unloaded on the tipping floor. From the tipping floor, it is fed into one of three processing lines where it is processed into Refuse Derived Fuel (RDF). Each line includes transfer conveyors, two trommels, one shredder, and two magnetic separators. From the processing lines it is conveyed to the power plant. A comprehensive fire detection and suppression system protects the plant from fire. Dust collectors on the processing lines keep plant air emissions within Virginia Department of Environmental Quality guidelines.

Generally, during processing hours, two lines are operated while the third is being serviced. The plant usually processes MSW 16 hours per day, Monday through Friday, but often increases to 24 hour operation during the week and 16 hours on Saturday to allow for maintenance and cleanup. MSW is received during the posted hours and coordinated with city trash collection schedules.

Conveyor System

MSW is unloaded, separated, and stored on the RDF plant’s 1.3 acre tipping floor. Nonprocessable items such as tires, mattresses, carpets, appliances, and propane tanks are segregated for separate disposal. Large bulky combustible items such as pallets, cardboard, and tree limbs are processed through a bulky waste shredder to reduce the initial volume and to allow better size reduction in the shredders. The balance of the material is fed into one of the operational processing lines via conveyor. Conveyors transport the MSW between the major processing stations throughout the plant. Some of the conveyors are metal pan type, but most are rubber belt type. They range in size for 24 to 84 inches wide and from 31 to 580 feet long. Two conveyors, each over 1000 feet long, transport the RDF from the processing plant to the power plant. One goes under Victory Blvd, the other rises steeply over Elm Ave. Two small conveyors route ferrous metals into waiting trucks. One emergency bypass conveyor is available to route RDF to other locations if necessary.

Tromelling System

From the tipping floor, waste is conveyed to the primary trommel, a drum 12 feet in diameter. Spikes within the trommel rip open bags to free waste, and six-inch holes along the walls separate waste. Items larger than six inches are transferred to the shredder.

The smaller waste is sifted through the primary trommel’s six-inch holes and conveyed to the secondary trommel. As this material is carried to the
As solid waste moves through the RDF Plant, continuous checks are conducted to ensure smooth plant operations. Through SPSA’s waste-to-energy system, more than 10,000 tons of metal is removed and over 42 million gallons of oil is saved each year.

**Shredding System**
A vertical hammer mill shredder, powered by a 1250 horsepower electric motor, reduces the incoming MSW to a 4-inch size at the rate of 80 tons per hour. Each shredder uses 28 swinging steel hammers, positioned down nine tiers of vertical axle, rotating at 600 RPM. Each shredder is enclosed within a containment building for safety. The building walls are made of 16-inch thick, steel reinforced, concrete. Entry is through heavy steel doors The building is also equipped with explosion vents, flame and heat detectors, a dust collection system, and water deluge system for additional protection.

**Magnetic Separation System**
Ferrous materials are removed from the waste stream by magnetic separators. The separators are located at the outlet of the shredders, between the primary and secondary trommels and at the exit, from the RDF plant. These machines use a revolving belt type magnet. The collected metal is dropped upon another conveyor which transports this material to an open top trailer. Approximately 13,000 tons of ferrous metal is extracted annually. The ferrous metal collected is recycled at the Ferrous Metal Recycling Plant in Suffolk.

**Other On-Site Operations**
The RDF Plant serves as the location for several other SPSA operations. A household hazardous waste collection facility is operated at the RDF Plant site to ensure the proper disposal of items such as pesticides, automotive products, household cleaners, and paint products. Also, SPSA allows residents to dispose of up to five gallons of used motor oil per visit to a collection site. These free services are offered to provide residents with the opportunity to properly dispose of potentially harmful household products, to reduce the risk of hazardous waste entering the waste stream, and to help protect surface and groundwater supplies.
early 50% of the waste managed by SPSA is used as fuel at the SPSA owned and operated Power Plant. Through this waste-to-energy system, trash is burned to create steam and electricity for the Norfolk Naval Shipyard. Excess electricity produced is sold to Dominion Virginia Power.

The Power Plant burns approximately 1500 tons of refuse derived fuel (RDF) daily, operating 24 hours a day, 365 days a year to meet the Shipyard’s steam and electrical demands.

Using RDF as fuel saves valuable fossil fuels and landfill space while disposing of residential and nonhazardous industrial waste.

The Power Plant also has enabled the WTE RDF Plant to eliminate its annual electrical payments to Dominion Virginia Power by installing an in-house power supply between the two plants, reducing electric cost by hundreds of thousands of dollars per year.

**Fuel Handling and Boiler Systems**

RDF is produced at SPSA’s Refuse Derived Fuel Plant and transported to the Power Plant via a conveyor system. The power plant contains four 180,000 pound per hour steam generation boilers. The RDF either is fed directly to the boilers or placed in a 4,000-ton capacity storage pit. RDF is retrieved from the pit using an overhead crane.

By burning refuse derived fuel (RDF) — fuel created from processed trash — the Power Plant can generate steam and electricity for the Norfolk Naval Shipyard.

Air swept feeders evenly distribute the RDF on the traveling gate for combustion. As the burning fuel is carried to the front of the boiler, the RDF is consumed, leaving nothing but ash for disposal.

Normally three boilers are in continuous operation leaving a fourth in reserve or available for maintenance. Each boiler also is capable of burning coal, although use is limited for economic reasons.

Each boiler burns about 20 tons of RDF per hour with furnace temperatures exceeding 1,800°F. The ash, which remains after burning, is quenched and transported to SPSA’s Regional landfill. Testing in accordance with DEQ procedures, ensures it meets all regulatory requirements for disposal.

To maximize efficiency, the hot flue gas leaving each boiler is used to preheat the water that will be converted to steam.

**WTE System Overview**
Steam and Electricity Systems

The Power Plant produces 100% of the Shipyard’s steam for process and heating, including that used by ships under repair or berthed in the shipyard. Demand is seasonal, since much of the export steam is used for heating. Export quantities vary from under 30,000 pounds per hour in the summer to over 250,000 pounds per hour in the winter.

Steam is produced at 750°F and 700 psig and exported from the plant at 150 psig and about 385°F. The reduction in temperature and pressure occurs in the turbines, which drive the electrical generators.

The plant supplies the major portion of the Shipyard’s electrical needs with three turbine generators capable of producing 20,000 kilowatts each. Generally, three generators are operated. Any excess electrical power is sold to Dominion Virginia Power.

Since very high quality water is required to produce steam, SPSA operates a sophisticated Water Treatment (demineralization) Plant on site. The Water Treatment Plant can produce 300 gallons per minute of very pure boiler feed water.

Air Pollution Control System

State-of-the-art air pollution control equipment is installed on each boiler. Flue gas passes into a spray dryer absorber (scrubber) where lime slurry is injected. The atomized slurry reacts chemically to neutralize the flue gas.

The process also cools the flue gas so that it can pass safely through fabric filters (bag house) which remove the particulate matter.

The Power Plant’s air pollution control equipment meets all federal and state environmental requirements.

Industrial Process Steam Available

Each year, about 50% of the municipal solid waste generated in southeastern Virginia is converted into refuse derived fuel used to create steam and electricity.

The Power Plant provides 150 psig superheated steam to the Norfolk Naval Shipyard but has significant, reliable excess steam generating capacity that is available for industrial use customers.

The many advantages of using steam generated from the Power Plant’s refuse derived fuel include:

- Consistent, high quality, economical steam
- Reduced dependance on fossil fuels
- Reduced pollution
- Preservation of valuable landfill space

Several industrial sites are available near the Power Plant. These locations are on navigable water; many have existing rail connections, and all are convenient to the Interstate Highway system.
Refuse Derived Fuel Plant

The RDF Plant began operation in January 1988. At the plant, solid waste is processed into fuel for use at the Power Plant.

Plant Operations

- Material separated by size
- Nonburnable material is removed
- Approximately 2,000 tons of waste processed daily
- Waste is received from SPSA transfer stations, and municipal and commercial haulers

Equipment

- Three process lines
- Truck scales
- Scalehouses
- Fixed cranes
- Conveyor belts

Hours of Operation

- Monday - Friday, 7:00 a.m. - 4:30 p.m. (Tipping floor open)
- Saturday, 7:00 a.m. - 12:00 p.m.

Power Plant

The SPSA owned and operated Power Plant began operation in December 1987. The facility’s primary function is to provide steam and electricity to the Norfolk Naval Shipyard using refuse derived fuel. The Power Plant is the Shipyard’s only source of heating and process steam for its shore facilities and ships in need of repair.

Plant Operation

- 1,500 tons of refuse derived fuel burned daily to create steam
- Steam generation of 500,000 pounds per hour
- 40-megawatt electrical generation
- RDF and coal firing capabilities

Equipment

- Combustion Engineering boilers
- General Electric turbine generators
- SDA/FF air pollution control system
- 4,000 ton RDF storage pit

Hours of Operation

- Seven days a week
- 24 hours a day

For more information, call Public Information at (757) 420-4700 or call the 24-hour information line at (757) 424-4297.