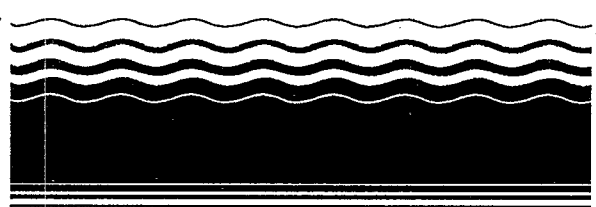




# SITE

SUPERFUND INNOVATIVE  
TECHNOLOGY EVALUATION



## Demonstration Bulletin

### Texaco Gasification Process

Texaco Inc.

**Technology Description:** The Texaco Gasification Process (TGP) has operated commercially for nearly 45 years on feeds such as natural gas, liquid petroleum fractions, coal, and petroleum coke. More than 45 plants are either operational or under development in the United States and abroad.

Texaco has developed waste gasification as an innovative extension of their conventional fuels gasification technology that converts carbonaceous materials containing organics into a mixture consisting primarily of hydrogen and carbon monoxide by reacting them with a limited amount of oxygen (partial oxidation) in a refractory-lined gasifier at temperatures in excess of 2,200 F (above the melting point of the ash in the feed stream) and at pressures greater than 250 psig. According to Texaco, these temperatures and

pressures are sufficient to destroy any hydrocarbons and organics in the feed and prevent the formation of undesirable hydrocarbon by-products associated with other coal/fossil fuel conversion processes.

The TGP produces a raw synthesis gas (syngas) as an intermediate product which can then be used to produce hydrogen, ammonia, methanol and other chemicals, as well as electrical power when combusted directly in a gas turbine. Since the TGP is operating at temperatures above the melting point of the ash in the feed stream, the residual ash forms a glassy slag.

Waste feed, along with coal, oil, and/or coke, is ground and mixed with water in a high solids concentration slurry (generally 55 to 70%).

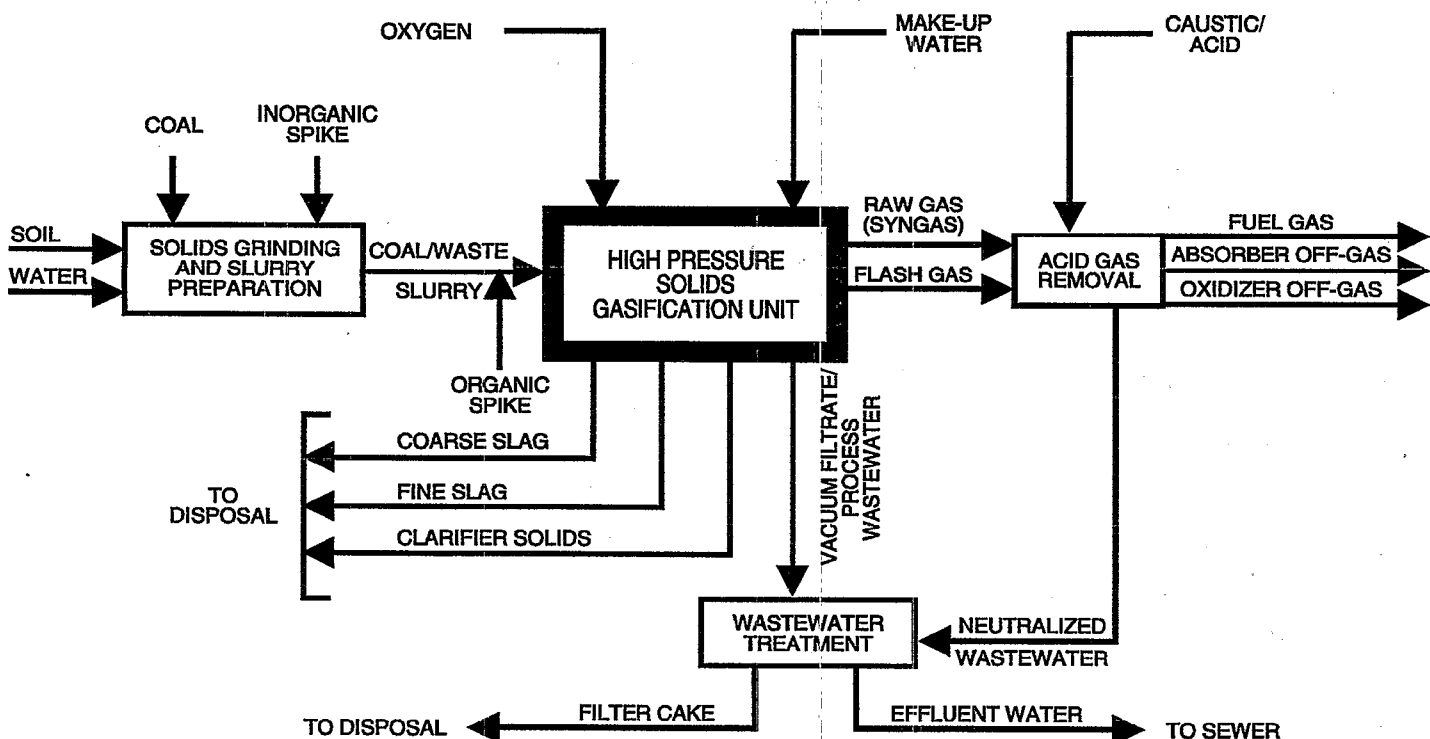


Figure 1. The Texaco Gasification Process



The process feeds the slurry, along with oxygen or air, to the gasifier through an injector nozzle. Water serves as a reactant, a temperature moderator, and a transport medium. Liquid and gas fuels, which can be fed directly to the gasifier, need no pretreatment but may require water or steam moderators. Chlorinated species in the feed become hydrogen chloride in the raw syngas; the hydrogen chloride solubilizes in the scrubber water before being purged from the process. The sulfur in the feed becomes hydrogen sulfide or carbonyl sulfide in the product gas. Commercial acid gas removal and sulfur recovery processes scrub these sulfides from the product gas and recover the sulfur. The residual ash is recovered as a glassy slag.

**Waste Applicability:** Since the TGP feed material is ground and slurried prior to introduction into the gasifier, virtually any type of carbonaceous material can be processed in the TGP, provided the pretreatment facilities are adequate to handle and treat the incoming material. Texaco reports that the TGP has been successfully demonstrated on coal liquefaction residues, petroleum production tank bottoms, municipal sludge, and surrogate-contaminated soil. This SITE Demonstration was conducted to evaluate the potential applicability of the TGP to treatment of a hazardous-waste-contaminated soil matrix.

**Demonstration Results:** The January, 1994 SITE Demonstration took place at the Texaco Montebello Research Laboratory in South El Monte, California. Figure 1 shows a block flow diagram of the TGP demonstration unit. The slurry feed consisted of coal, water, waste soil from the Purity Oil Sales Superfund Site in Fresno, California, and clean soil. It was spiked with heavy metals (lead and barium) to ensure that the feed contained sufficient levels of contamination to fail the Toxicity Characteristic Leaching Procedure (TCLP) test. Addition of a volatile organic (chlorobenzene) provided detectable levels in the product gases to facilitate the calculation of the Destruction and Removal Efficiency (DRE).

Three replicate tests were conducted. Slurry was fed to the gasifier at 2,200 lb/hr. The total amount of slurry treated during the three runs was approximately 40 tons. The total amount of slurry treated

during the entire Demonstration, which included scoping runs, initial shutdown, system start-up, a pretest run, the three replicate runs, and post-demonstration processing of the slurry inventory, was approximately 100 tons.

Preliminary findings from the TGP SITE Demonstration are summarized below:

- The average composition of the dry synthesis gas product from the TGP consisted of 37% hydrogen, 36% carbon monoxide and 21% carbon dioxide. No organic contaminants, other than methane (55 ppm), were above 0.1 ppm.
- The DRE for the volatile organic spike (chlorobenzene) was greater than the 99.99% goal.
- The primary TGP solid product, coarse slag, complied with the TCLP regulatory requirement for lead (5 mg/L) and the TCLP and California Waste Extraction Test (WET) regulatory requirements for barium (100 mg/L). The coarse slag did not meet the WET standard for lead (5 mg/L).
- Volatile heavy metals, such as lead, tend to partition and concentrate in the secondary TGP solid products—fine slag and clarifier solids. These secondary products did not comply with the TCLP and WET regulatory requirements for lead but did meet the standards for barium.

A Technology Capsule and an Innovative Technology Evaluation Report will be available in the summer of 1994.

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