

SECTION 12

STARTUP PROCEDURES

12.1 GENERAL PROCEDURE

This is a generalized description. It describes a proper sequence of unit startups for the POGO plant.

The procedural steps delineated below are based on the successful completion of standard procedures for plant acceptance and preliminary testing, including pressure testing, instrument checkout, rotating equipment tests, and preliminary operation on air, water, or other liquids.

12.2 SPECIAL FEATURES

Certain features of the POGO plant design will represent operations new to process plants, due either to the use of novel technology or to the large scale of operations in the plant. Because of this factor, special control and safety features will be incorporated into the ultimate plant design. Special attention will be needed for operation of these systems at abnormal rates or conditions; i.e., during startup. These conditions include:

- (1) Control of gasifier on flame-out or coal feed interruption
- (2) High capacity gas venting and flaring from several different areas, possibly containing unsafe gas mixtures
- (3) Special requirements for flushing systems with solvent or wash oils on shutdown to prevent line blockages due to coking and/or solids settling

12.3 STARTUP SEQUENCE

Because of the large size and large power and steam usage of much of the plant equipment, preliminary testing will require substantial power and steam flow. Therefore, among the first units to be made operational, using either purchased power, portable generators, or the plant emergency power generating system, will be certain portions of Unit 39, Potable and Sanitary Water System; Unit 40, Raw Water System; Unit 45, Instrument and Plant Air; and Unit 35, Steam and Power Generation, which will thereafter supply all steam and power for the new plant complex. Early completion of a portion of Unit 35 would make lower cost power available for the later plant construction phase as well as for the plant startups. To allow startup of these units without generation of fuel gas (their normal fuel) the gas turbines are designed for dual firing with fuel oil. For initial startup, a quantity of liquid fuel will be purchased. After that, fuel gas and product fuel oil will be available.

The expected plant startup procedure, assuming standby operation of power and steam generation on a liquid fuel, will be:

- (1) Start Unit 41: Effluent Water Treating, and then start Units 9 and 10, Coal Preparation and Coal Storage, Grinding and Drying. Start Unit 11: Oxygen Plant. Start Unit 33: Fuel Gas Generation. Start Unit 34: Fuel Gas Acid Gas Removal, and Unit 32: Sulfur Plant, and use clean fuel gas to replace purchased liquid fuel in Unit 35: Steam and Power Generation. Operation of the plant propane refrigeration system will be required for operation of Unit 34.
- (2) Start circulation of amine solution in Unit 26: Olefinic Gas/Acid Gas Removal. Start Unit 15: Pyrolysis, Unit 18: Process Gasification, and Unit 16: Pyrolysis Atmospheric Distillation. Start Unit 19: Shift Conversion, Unit 20: Selective Acid Gas Removal, and Unit 26: Olefinic Gas/Acid Gas Removal.
- (3) Start circulation of solvent* in Unit 12: SRC Dissolving, Unit 13: SRC Atmospheric Distillation, and Unit 14: SRC Vacuum Distillation. Pressurize Unit 12 with purchased cylinder hydrogen and heat Units 12, 13, and 14 to operating temperature.
- (4) Start Circulation of amine solution in Unit 27: Saturate Gas/Acid Gas Removal. Introduce coal to Unit 12 and line out process units. Start Unit 29: Hydrogen Recovery and Purification, Unit 30: SNG Purification, and Unit 31: LPG Fractionation. Bring Unit 21, Heavy Liquid Hydrotreating; Unit 22, Thermal Cracking; Unit 23, Coking, Unit 24; Naphtha Hydrotreating, and Unit 25, Naphtha Reforming, on-line as feeds are available. Place Unit 17: Sour Gas Compression compressors into operation as gas is available and commence feed to Unit 27.

12.4 FUEL GAS GASIFIER STARTUP

The startup of Unit 33 will be at low pressure by means of oxygen/coal combustion in the first stage with steam/water spray in the second stage to moderate the temperature. Temperature rise should be slow to protect the refractory internals, lining out at design temperatures of 1800°F in the first stage. Coal will gradually be introduced into the second stage producing gas and char which will be separated in the cyclones. The char will be sent to the first stage. After satisfactory operation is proven at low pressure, the pressure will be gradually raised to operating pressure. Fuel oil will be maintained on circulation to oil burners without introduction into the gasifier to serve as an emergency hydrocarbon feed in case of coal feed failure.

*For initial startup, SRC-derived solvent will not be available. DOEs Tacoma Pilot Plant started up successfully on a mixture of petroleum-derived oil and coke oven-derived oils, which is a candidate for startup oil for the POGO complex.

12.5 PYROLYSIS AND PROCESS GASIFIER STARTUP

The pyrolysis and process gasifier units will be started together since the gasifier is the heat source for the pyrolyzer operation. The pyrolyzer will be started first, feeding coal and using superheated steam as the carrier gas and heat source. The partially devolatilized coal is separated from the gas in the first-stage cyclones and fed to the first stage of the process gasifier. Combustion will be with oxygen. The steam/water spray in the second stage will moderate the temperature. Temperature rise should be slow to protect the refractory internals. Char from pyrolysis will be introduced into the second stage of the gasifier and the steam/water spray reduced. The char and gas from the gasifier will be separated in a cyclone and the hot char will be recycled to the pyrolyzer to provide heat. The steam used as carrier gas will gradually be reduced as gas becomes available from pyrolysis. After satisfactory operation is proven at low temperature the system pressure will be increased to operating pressure. The vacuum bottoms slurry will be introduced into the pyrolyzer as it becomes available and the coal feed will be reduced accordingly. Fuel oil will be maintained on circulation to oil burners without introduction into the gasifier to serve as an emergency hydrocarbon feed in case of char feed failure. The fuel oil circulation will be discontinued when continuous satisfactory steady state operation is achieved.

12.6 GASOLINE AND HYDROGEN MANUFACTURE

As sweet gas becomes available from Unit 26, commence feeding to, and place into operation, Unit 28, Olefin Recovery and Polymerization.

When gas is available from Units 25 and 27, place Unit 29, Hydrogen Recovery and Purification, into operation.

These procedures, with careful prior preparation and training, moderated by experienced judgment in the field, should provide an effective startup.