



EERC

Energy & Environmental Research Center

EERC Technology – Putting Research into Practice

Description of Test Facilities

Particulate Test Combustor



Grand Forks, North Dakota

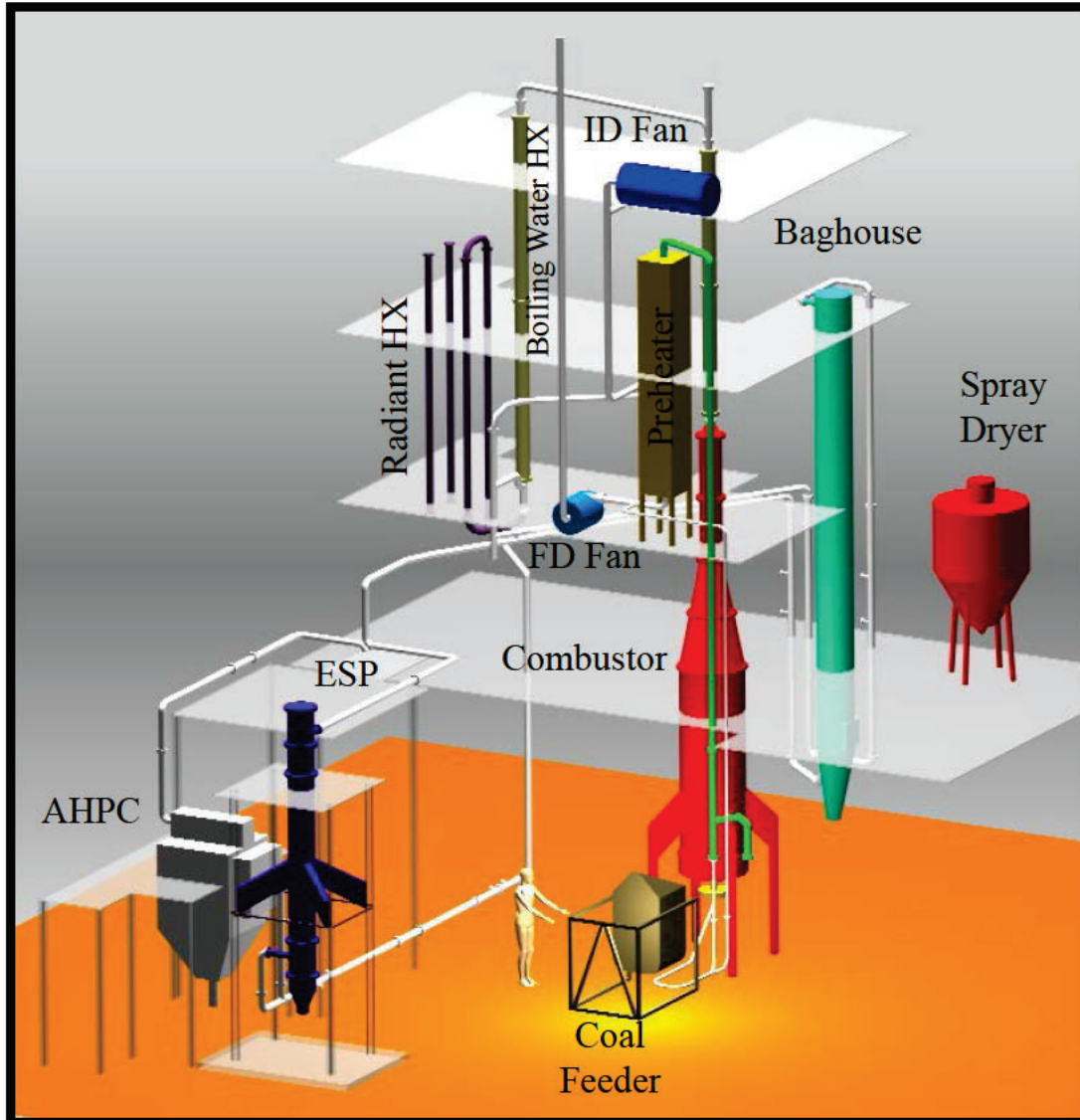
Particulate Test Combustor

- The particulate test combustor (PTC) is a 550,000-Btu/hr pulverized coal-fired unit designed to generate fly ash representative of that produced in a full-scale utility boiler.
 - Combustor is oriented vertically to minimize wall deposits.
 - Coal is introduced to the primary air stream via a screw feeder and eductor.
 - The coal nozzle fires axially upward from the bottom of combustor.
 - Secondary air is introduced concentrically to primary air with turbulent mixing.

PTC as a Workhorse

- The PTC is the most employed pilot-scale facility at the EERC, having completed over 1000 tests.
- The PTC most closely mimics full-scale boiler particulate generation characteristics.
- The Ontario Hydro method was validated on the PTC.
- The PTC is a proven technology development platform as a precursor for field validation.

PTC Suite



PTC Instrumentation

- Instrumentation permits continuous, real-time recording and monitoring of:
 - Temperatures
 - Pressures
 - Flow rates
 - ESP electrical performance
 - Flue gas constituent concentrations
 - Up to three simultaneous sample locations
 - CO, CO₂, SO₂, NO_x, O₂, and Hg are typically monitored.
 - Particulate control device operating data to be monitored/recorded continuously on a data acquisition system.



Flue Gas Analyzer

Particulate Control Devices



Tubular ESP

- Tubular ESP
 - Single-mast, multitip electrode
 - Tubular collection plate
 - Mimics full-scale ESPs by attaining similar flue gas velocity

Particulate Control Devices (continued)

- Reverse-air baghouse
 - Single cylindrical fabric filter in a 20 in. housing
 - Typical air-to-cloth ratio: 2 ft/min
- Pulse-jet baghouse (PJBH)
 - Up to three cylindrical fabric filters in a 20 in. housing
 - Typical air-to-cloth ratios: 4, 6 or 12 ft/min

Particulate Control Devices (continued)

- Advanced Hybrid Particulate Collector (AHPC)



AHPC

- EERC-patented technology that combines ESP with fabric filtration
- Typical air-to-cloth ratio: 12 ft/min

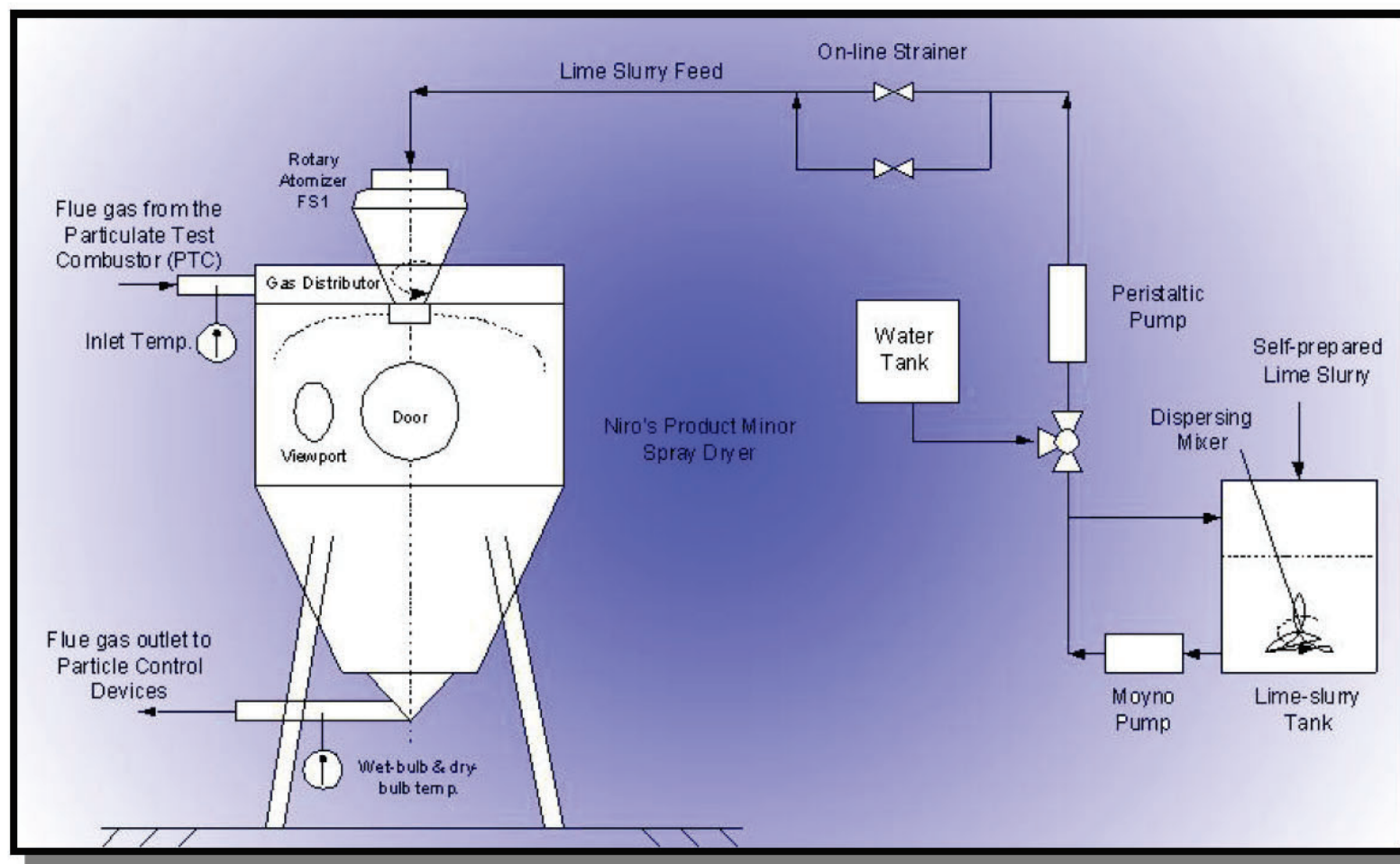
Flue Gas Conditioning Devices



Spray Dryer

- Spray dryer adsorber (SDA)
 - Recent addition to the PTC suite
 - Used for SO_2 control and mercury investigations
 - Drying chamber I.D. = 4 ft, height = 2.5 ft
 - Typical residence time of 8 sec
 - Lime slurry feed rate 9–11 kg/hr with 33%–38% solid content (4% $\text{Ca}[\text{OH}]_2$)

Flue Gas Conditioning Devices (continued)



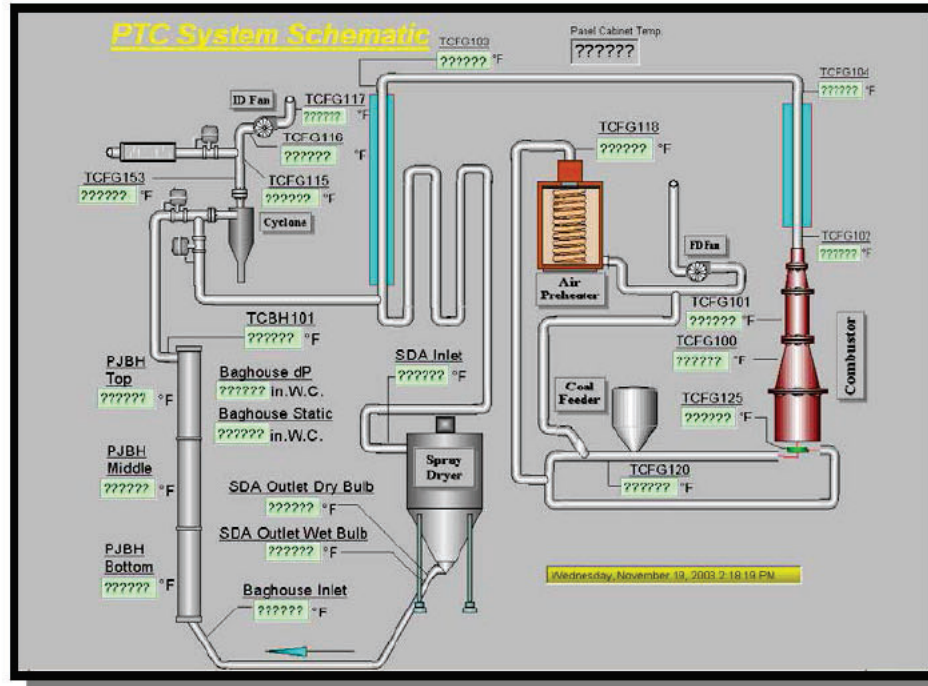
Spray Dryer Flow Diagram

Flue Gas Conditioning Devices (continued)

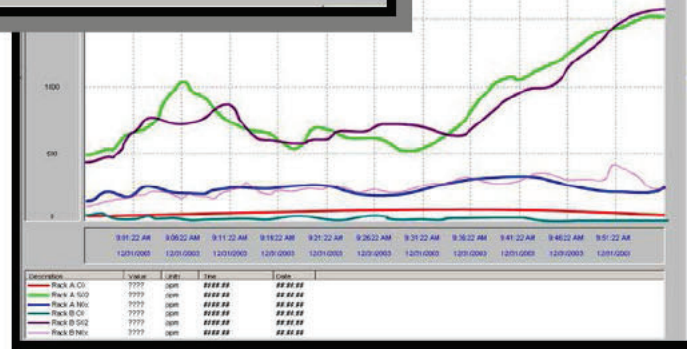


- Selective catalytic reduction (SCR) reactor
 - Cormetech, Inc.
 - 18 ft. tall, 8 in. dia.
 - Simulates unit at TVA's Paradise Station
 - Operating Temp.: 650°–700°F

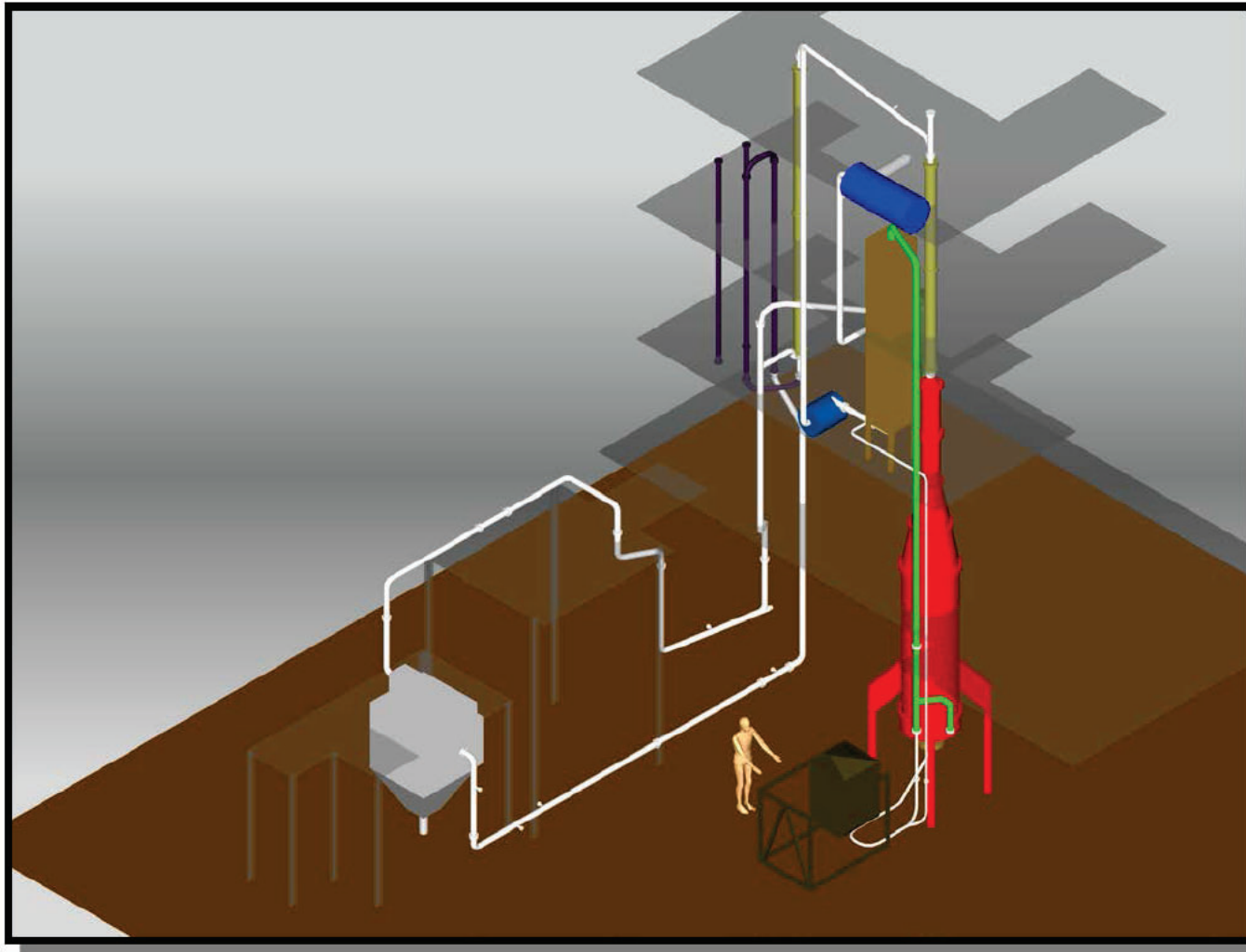
Data Acquisition System



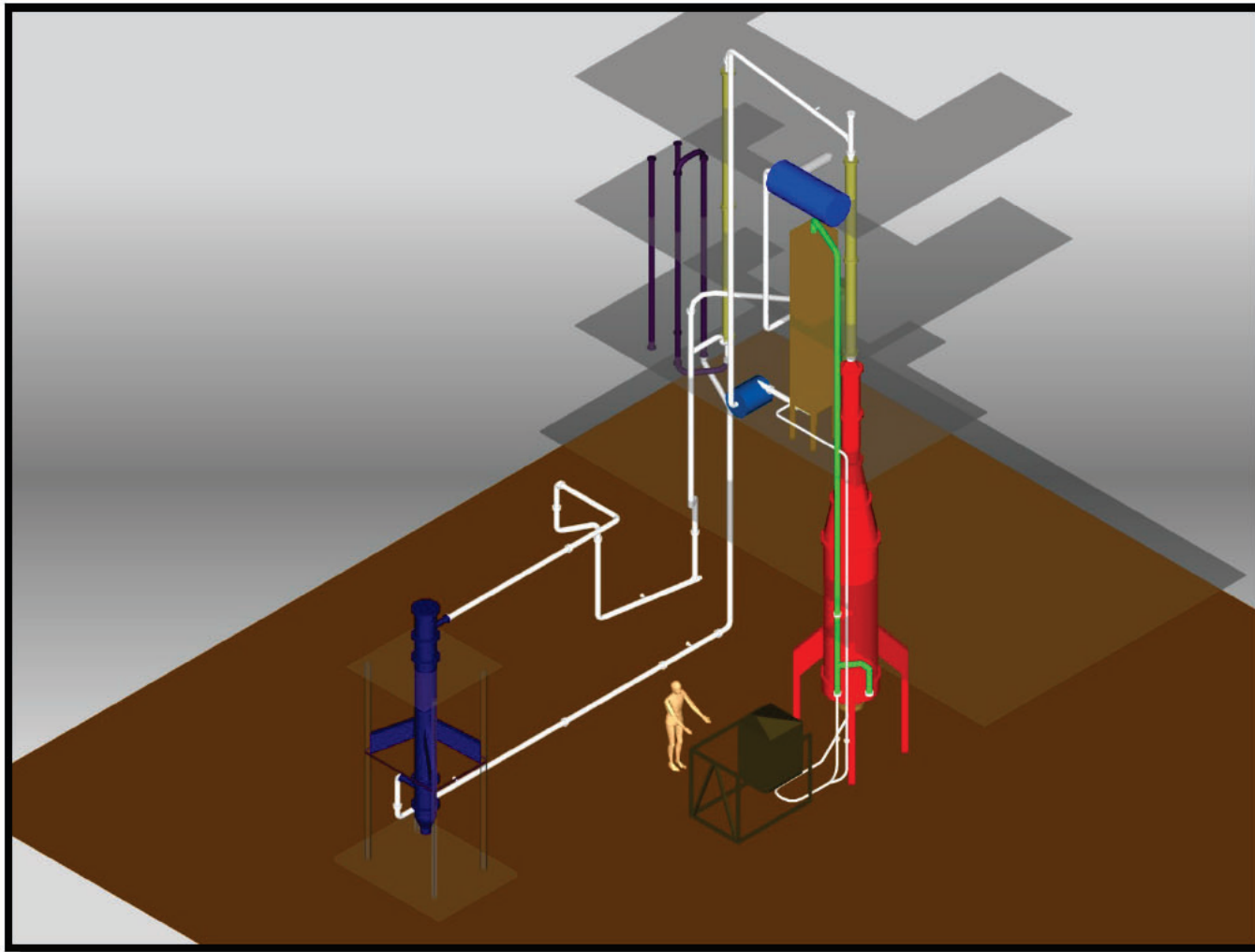
Data Acquisition
Screen Samples



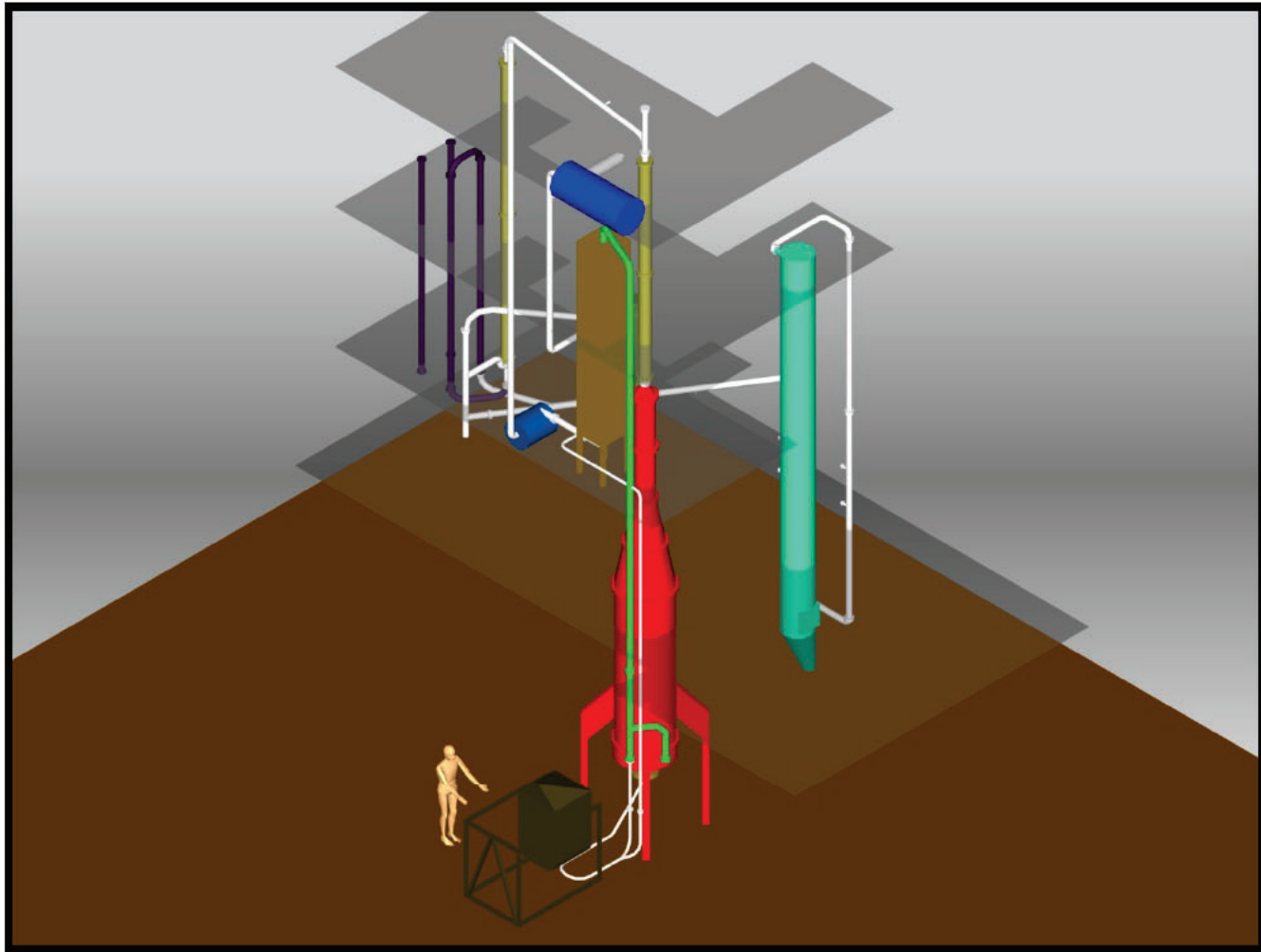
PTC Suite – AHPC-Only Configuration



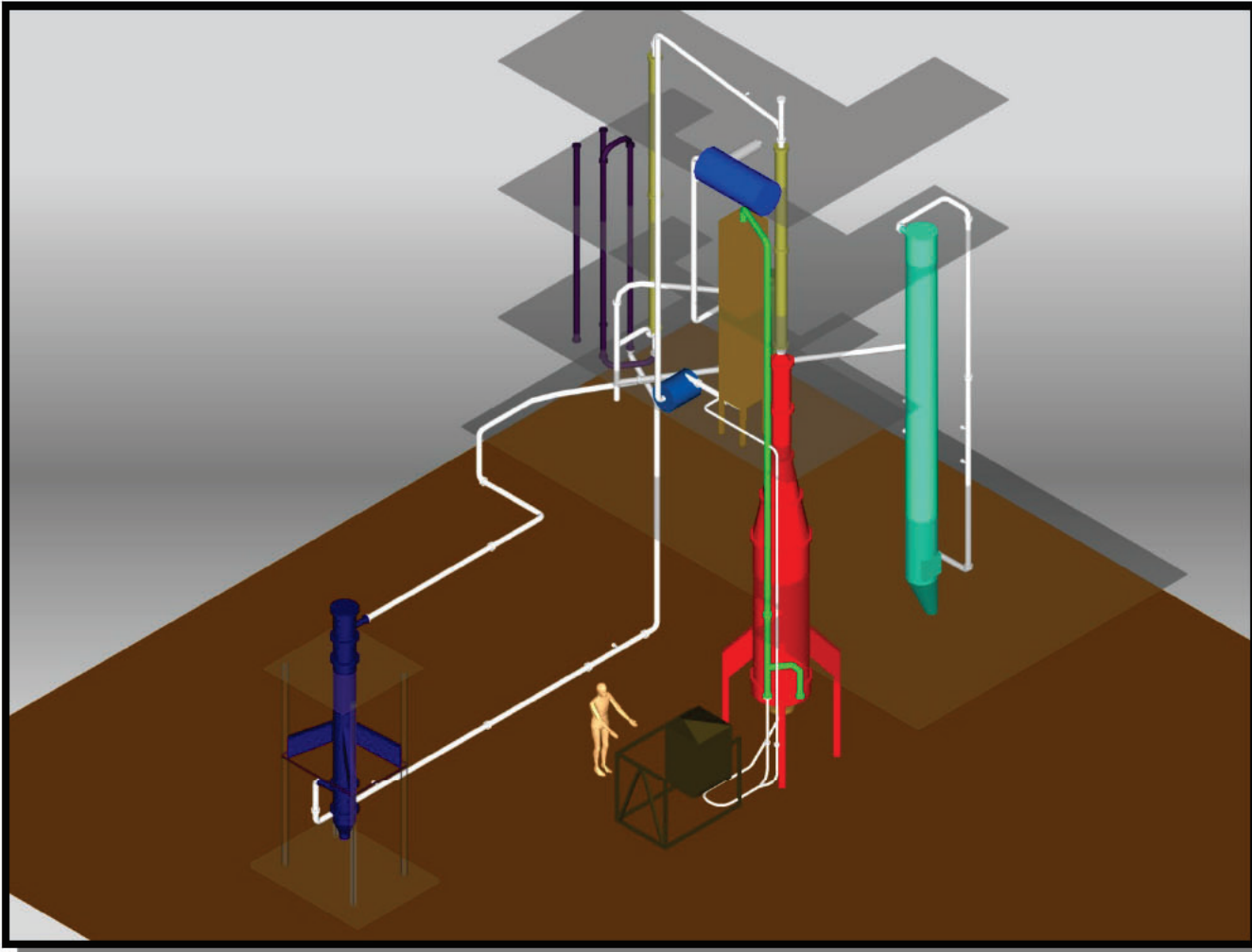
PTC Suite – ESP-Only Configuration



PTC Suite – PJBH-Only Configuration



PTC Suite – ESP + PJBH Configuration



PTC Suite – SDA + PJBH Configuration

