

## CLIN 1 Attachment 7 – Project Operations

Provide project operation support as detailed in the project's standard operating procedure. These resources shall be permitted to perform maintenance and modification support to the project that would otherwise be requested via the support pool resources. This does not exempt the project from submitting work request to ensure proper management of change and quality inspections.

### **Albany**

#### **Structural Materials Team –**

Support Advanced Alloys, Sunshot, Bio DG, Melt Processing of Covetic Alloys, Midstream, SMRF Laboratory, and WFO activities. Historically this 3.4 FTE of support has been provided by five individuals. Three full time dedicated technicians and two at 0.2 FTE each. This staffing is required to ensure testing can be performed in a manner that meets the R&D goals.

Provide support for producing alloys via melting, casting and thermo-mechanical processing of experimental alloys. Trained in operation and experienced with using the alloy production equipment associated with the following NETL R&D SARS permits: (i) 0914 Induction Furnace Melting; (ii) 0904 Building 4 VAR/ESR; (iii) 0923 Solar Vacuum Furnace; and (iv) 0903 Fabrication. Assist NETL with the modification of equipment necessary for conducting this CRADA research. This shall include, but is not limited, installation, and procurement of components.

Providing support for air induction furnaces and VAR melting of alloys. This includes but not limited to: (i) assistance preparing alloys for melting; (ii) operating air induction furnaces and the VAR furnace; (iii) assistance with conducting post melting fabrication (heat-treating, forging and rolling as needed; (iv) modification of furnaces for melting alloys as needed; and (v) procurement of materials and supplies as needed.

Provide support for operating NETL mechanical testing equipment (creep frames, screw driven load frames servo-hydraulic load frames) needed to perform the mechanical tests associated with these projects. Experienced, trained and approved to operate equipment associated with NETL's creep lab (PAN 0979) and mechanical testing laboratory (PAN 0910). Shall test samples through this task to include commercial and NETL experimental alloys, and samples exposed to various environments (such as but not limited to sCO<sub>2</sub> and USC steam) needed for comparison.

Provide support for conducting SMRF Laboratory pre- and post-sCO<sub>2</sub> test activities as required; and capable of maintaining the sCO<sub>2</sub> pump after every 1,500 hours of operation (PAN 0920).

Provide technician support for conducting low temperature corrosion experiment in sCO<sub>2</sub> environments in NETL's HiPERT Laboratory (PAN 0912) and other autoclave experiments.

Provide LabVIEW support to SMT.

Support for metallographic sample preparation in NETL's Metallography Lab (PAN 0916). Historically this support has been provided by two people.

The Metallography Laboratory performs all phases of metallographic investigative techniques on various metals, alloys, refractories and minerals. All sample materials shall be returned to the researcher.

Project specific on-the-job training is required to meet the minimum operator training requirements.

#### **Innovative Energy and Water Processes Team –**

Support the MHD Lab PAN 0980. Historically this 0.9 FTE of support has been provided by two individuals at 0.5 and 0.4 FTE. This staffing is required to ensure testing can be performed in a manner that meets the R&D goals.

The primary purpose of the MHD (magnetohydrodynamics) Laboratory is to perform model validation for MHD energy conversion applications, and to conduct materials performance evaluations for those applications. A secondary purpose of the MHD laboratory is to develop the components to conduct the materials and model validation research. Further, these components may also serve as precursors to future full-scale systems.

Support for sample preparation in NETL's Metallography Lab, PAN 0916. The Metallography Laboratory performs all phases of metallographic investigative techniques on various metals, alloys, refractories and minerals. All sample materials shall be returned to the researcher.

## **Morgantown –**

### **Thermal Sciences Team -**

Support to the Chemical Looping Reactor, PAN 0545. The project anticipates four runs of six days with 24-hour operations. Two operators are required for each shift. The remaining support is required for pre/post run maintenance, set-up and reconfiguration support. Duties include operations of a high temperature combustion process that involves fluidization and pneumatic transport of solid materials.

The project operators must possess the following skills:

- Demonstrated troubleshooting skills for a broad range of problems, including mechanical, thermal, pneumatic, flow control and lock-hoppers. Leak testing experience is advantageous.
- Works effectively as part of a team
- Can work independently to assess process conditions such as fuel-air equivalence ratio and independently adjust parameters to maintain process control.
- Oral communication skills must include the ability to clearly describe issues and the ability to listen and understand other people's point of view. Experience providing shift-changeover debriefings are advantageous.
- Experience with basic process control (i.e., automatic vs manual control) is required. The ability to program ramping functions in a Wonderware HMI is advantageous.
- Access to research LAN is required to operate this project. Since Foreign Nationals from sensitive countries do not have access to the research LAN, they cannot operate this project.
- At least one year of project specific on-the-job training, or equivalent experience, is required to meet the minimum operator training requirements.

### **Aero-Thermal:**

The Aero-Thermal Group requires support for the operation, maintenance and modifications to the Pressurized Pulse Combustor, PAN 0505. Duties include operation of a high-pressure natural gas combustion test rig in which process gas temperatures can exceed 2500F. This project requires working with high pressure (700psi) natural gas compression systems and high pressure (600-700 psi) air and nitrogen headers.

The project operators must possess the following skills:

- Demonstrated troubleshooting skills for a broad range of problems, including mechanical, thermal, pneumatic, flow control, atomizers, and high pressure water quench systems. Leak testing experience is also advantageous.
- Works effectively as part of a team
- Can work independently to assess process conditions such as fuel-air equivalence ratio and independently adjust parameters to maintain process control.

- Oral communication skills must include the ability to clearly describe issues and the ability to listen and understand other people's point of view.
- Experience with basic process control (i.e., automatic vs manual control) is required. The ability to program ramping functions in a Wonderware HMI is advantageous.
- Access to research LAN is required to operate this project. Since Foreign Nationals from sensitive countries do not have access to the research LAN, they cannot operate this project.
- At least 2 years of project specific on-the-job training, or equivalent experience, is required to meet the minimum operator training requirements.

RDE requires support for the operation, maintenance and modifications to the LECTR, PAN 0503. Duties include operations of a high pressure combustion process that detonation based combustor.

The project operators must possess the following skills:

- Detailed understanding of process control and operating systems. Must be able to perform "user adjustable" modifications and troubleshooting of control system and instrumentation.
- Demonstrated troubleshooting skills for a broad range of problems, including mechanical, thermal, pneumatic, flow control and some instrumentation. Leak testing experience is advantageous.
- Works effectively as part of a team
- Can work independently to assess process conditions such as fuel-air equivalence ratio and independently adjust parameters to maintain process control.
- Oral communication skills must include the ability to clearly describe issues and the ability to listen and understand other people's point of view.
- Access to research LAN is required to operate this project. Since Foreign Nationals from sensitive countries do not have access to the research LAN, they cannot operate this project.
- At least 2 years of project specific on-the-job training, or equivalent experience, is required to meet the minimum operator training requirements.
- Installation / removal of instrumentation and hardware.
- Fabrication of mounting systems for unique instrumentation in a space constrained environment (not confined space).
- Willingness to learn new control system and hardware as modifications and new instrumentation are added to the system.

### **Reaction Engineering Team -**

The Reaction Engineering Team requires support for the operations, maintenance and modifications in the REACT Facility, PAN 0651. Reaction Analysis and Chemical Transformation (ReACT) facility in B14 will be comprised of several highly flexible lab-scale reactors to explore fundamental and applied fuel processing R&D issues. These issues include: fundamental

understanding of reforming process, kinetic measurements, understanding the mechanism of catalyst poisoning, synthesis gas reactions such as water gas shift, preferential oxidation, and Fischer-Tropsch, tar cracking, coal and biomass gasification/pyrolysis, fuel desulfurization, HCl removal, chemical looping of gaseous and solid fuels, CO<sub>2</sub> removal, process parameter optimization, and catalyst development and characterization. This facility will also be used to study the effect of microwave and RF (radio frequency) energy generated within the reactor on the abovementioned catalytic reactions. Additionally, this facility is fuel flexible such that coal, biomass, coal/biomass mixture, natural gas, methanol, ethanol, diesel fuel, kerosene, military logistic fuels, vegetable oils, heating oils and their surrogates may be utilized as feedstock. A series of catalysts or sorbents, commercially available or developed at other NETL laboratories or provided by external laboratories, can be used in the ReACT Facility.

### **Geophysics Team –**

The Functional Materials Team requires support for the operations, maintenance and modifications of the CT Scanner Project, PAN 0596 and the Non-Destructive CT Imaging Lab, PAN 0514. The laboratory uses computed tomography (CT) scanners at NETL's Geological Services Laboratory in Morgantown, WV, to peer into geologic core samples to determine how liquids, solids, and gases flow through them. The lab's three CT scanners—a medical CT scanner, an industrial CT scanner, and a micro CT scanner—serve different purposes. The medical scanner is useful for fluid-flooding evaluations and observations of sub-core bulk properties; the industrial scanner can portray pore networks; and the micro scanner analyzes pore surfaces. The lab's mobile core-logging unit to measure the physical properties of the samples. The knowledge that researchers gain by using the lab has real-world applications. For instance, researchers can learn how carbon dioxide behaves in coal samples or how foamed cement holds up once it is injected into an offshore wellbore. Such insights are relevant to carbon sequestration and hydraulic fracturing.

### **Functional Materials Team –**

The Functional Materials Team requires support for the operations, maintenance and modifications in the REACT Facility, PAN 0651 and the B-3 Reactor Lab 0533. Engineering technicians will be primarily operating fixed bed flow reactor units and fluidized bed flow reactor units and analytical equipment (e.g. mass spectrometers) associated with the reactor units. They will operate the units according to the tests plans provided by the principal investigator. Operations include high pressure and high temperature, and thorough knowledge of operating procedures for the units are required. Other tasks include:

- Perform all troubleshooting and hands on tasks associated with unit
- Develop and review reactor design to ensure unit is safe and efficient to operate
- Provide necessary information required for the safety analysis and review
- Rebuild valve's and pneumatic actuators
- Perform pressure test daily

- Perform routine and non-routine maintenance on all equipment (pumps, analytical, and the unit itself)
- Troubleshoot all analytical equipment (e.g. mass spectrometers)
- Perform Calibration/ calibration checks daily
- Extract and Process data for review (e.g. Excel sheets)
- Assist preparation materials such as oxygen carriers for the reactor units
- Generate Purchase Request for supplies needed for unit
- Installing gas delivery lines and other required items to operate thermogravimetric analyzers and small-scale flow reactor units

### **Innovative Energy and Process Water Team –**

The Fuel Cell research group requires support for the operations, maintenance and modifications of the DOE Fuel Cell Test Facility, PAN 0559; Solid Oxide Fuel Cell Experimental Laboratory, PAN 0560; SOFC Evaluation Laboratory Staging Area, PAN 0563; SOFC Multi-Cell Array, PAN 0602; SOFC Applied Materials Measurement Instrumentation & Evaluation Lab, PAN 0625. NETL's Solid Oxide Fuel Cell Experimental Laboratories test stands can subject fuel cells to demanding conditions (up to 1,000 degrees Celsius and 90 pounds per square inch gauge). The lab is also equipped for current-interrupt and spectral impedance analyses. Researchers at the lab explore how single fuel cells—or small stacks of them—perform; they investigate high-temperature fuel cells, assess how contaminants degrade them, and help develop sensors that measure their temperature, strain, and heat flux. They also invent new materials to advance the use of fuel cells in more applications as well as establish testing protocols. By enabling this body of research, the lab helps scientists support the Solid State Energy Conversion Alliance Program, which strives to develop affordable fuel cell technologies that reduce the carbon emissions associated with producing power from coal.

### **Pittsburgh –**

#### **Functional Materials Team**

Support for the operations, maintenance and modifications in the Pittsburgh Magnetics Characterization Laboratory, PAN 0282, Pittsburgh Magnetics Fabrication and Testing Laboratory, PAN 0283. The laboratories are used to fabricate and analyze prototype components comprised of advanced magnetic and dielectric materials including inductors, transformers, sensors, and capacitors amongst others. For example, magnetic inductor and core fabrication can consist of spooling of metallic alloy ribbons into a core geometry, impregnating with an epoxy, cutting to modify the shape and / or introduce a gap, and winding with wires for subsequent electromagnetic testing. In many cases, wound cores will be subsequently treated in an applied magnetic field or under an applied tensile strain to optimize their subsequent properties. In other cases, wires or ribbons of magnetic material can be cut to size and installed onto pre-made fixtures to allow for impedance measurements as a function of applied magnetic field and frequency.

The Advanced Sensors Development Laboratory PAN 0168 and the Subsurface Sensor Development Laboratory require the operations, maintenance and modifications support. These labs develop and test advanced sensor materials and techniques for measurements relevant to the fossil energy power generation and subsurface environments. These will include materials and techniques for sensing gas species at elevated temperatures using electrochemical properties of thin films, RF measurements on ceramic surface acoustic wave-based devices, and optical measurements of thin film materials.

### **Geo-Analysis and Monitoring Team**

The Geo-Analysis and Monitoring team requires support conducting field assessment for Air Monitoring Operations, PAN 0190. This support is typically short duration and requires travel. The goal of this project is to help assess the impact of air emissions from oil and natural gas exploration and production activities and to help develop models of the impacts on local and regional ambient air quality. To accomplish this, a mobile air monitoring station is deployed in select field locations, downwind of active oil and gas fields, to collect ambient emissions from oil and gas activities and then use the data to develop atmospheric chemistry and transport models for understanding local and regional air quality impacts. Researchers look for gas emissions like methane, particulate matter, oxides of nitrogen, volatile organic compounds, and other species that could cause changes to air quality.

### Historical Estimating Information

Site	2018	2019
Albany	5.5 FTE	6.45 FTE
Morgantown	16 FTE	13 FTE
Pittsburgh	0.44 FTE	0.73 FTE