

Profile SFR-77

METL

USA

GENERAL INFORMATION

NAME OF THE FACILITY Mechanisms Engineering Test Loop
ACRONYM METL (pronounced "Metal")
COOLANT(S) OF THE FACILITY Sodium
LOCATION (address): Bldg. 308 / 9700 South Cass Avenue / Lemont, IL 60439 / USA
OPERATOR Argonne National Laboratory
CONTACT PERSON Chris Grandy
(name, address, institute, function, telephone, email): Bldg. 208
Office: A252
9700 South Cass Avenue
Lemont, IL 60439
USA

Argonne National Laboratory
Department Manager,
Nuclear Engineering Division

630-252-9135
cgrandy@anl.gov

Alternate: Dr. Mike Hvasta
630-252-4793
mhvasta@anl.gov

STATUS OF THE FACILITY Under Construction
Start of operation (date): 2016

MAIN RESEARCH FIELD(S)

- Zero power facility for V&V and licensing purposes
- Design Basis Accidents (DBA) and Design Extended Conditions (DEC)
- Thermal-hydraulics
- Coolant chemistry
- Materials
- Systems and components
- Instrumentation & ISI&R

TECHNICAL DESCRIPTION

Description of the facility

The mission of the Mechanisms Engineering Test Loop (METL) is to provide the infrastructure for the testing of various small and intermediate-scale fast reactor systems and components in a prototypical environment.

Argonne National Laboratory (ANL) has been designing and constructing an experimental facility that will provide the infrastructure to test small to intermediate-scale fast reactor components under prototypical conditions. This facility, which is referred to as the *Mechanisms Engineering Test Loop* (METL), will provide a centralized system that is capable of pumping (0-10 GPM), heating (1200°F), and purifying (< 3 wppm) up to 800 gal of sodium. This infrastructure will be located beneath a mezzanine structure. To access the sodium, users will insert experiments into one of several 18" and 28" diameter test vessels that are connected to the main piping system and located on the top of the mezzanine structure.

The METL user facility will also provide a moist-CO₂ cleaning process for instrumentation that has been removed from the system.

Acceptance of radioactive material

Not currently

Scheme/diagram

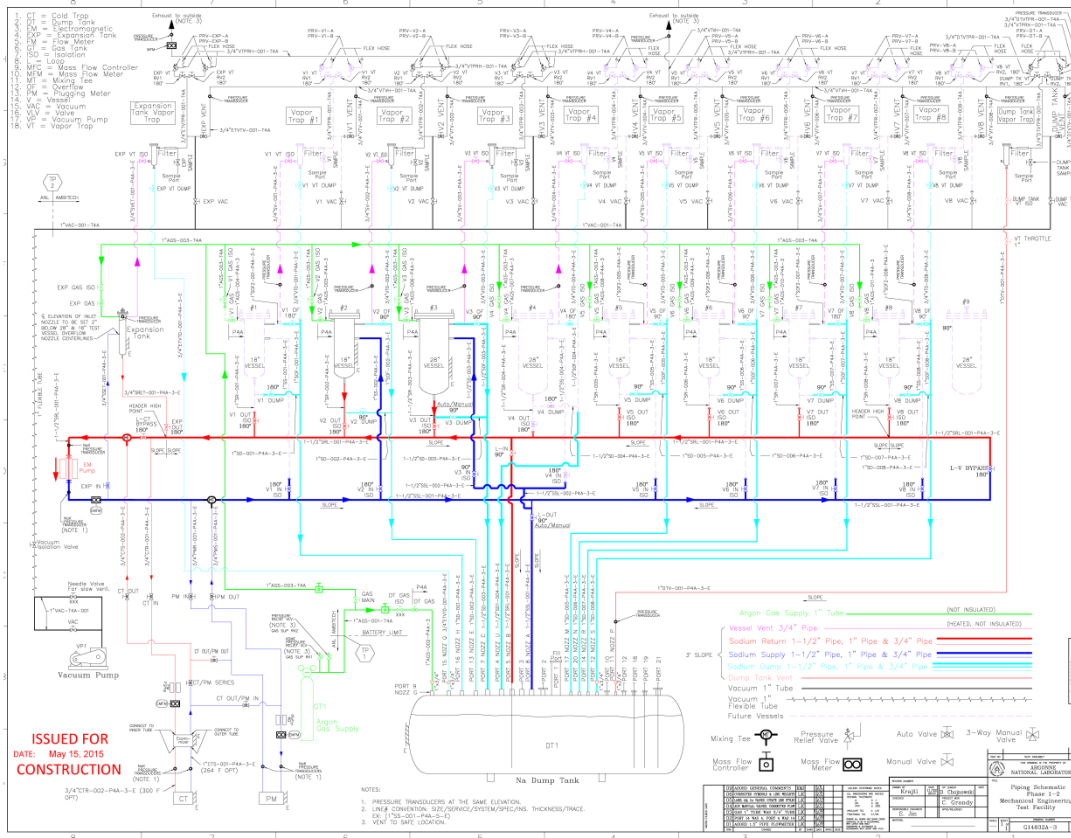


FIG. 1. Scheme of the METL facility.

3D drawing/photo

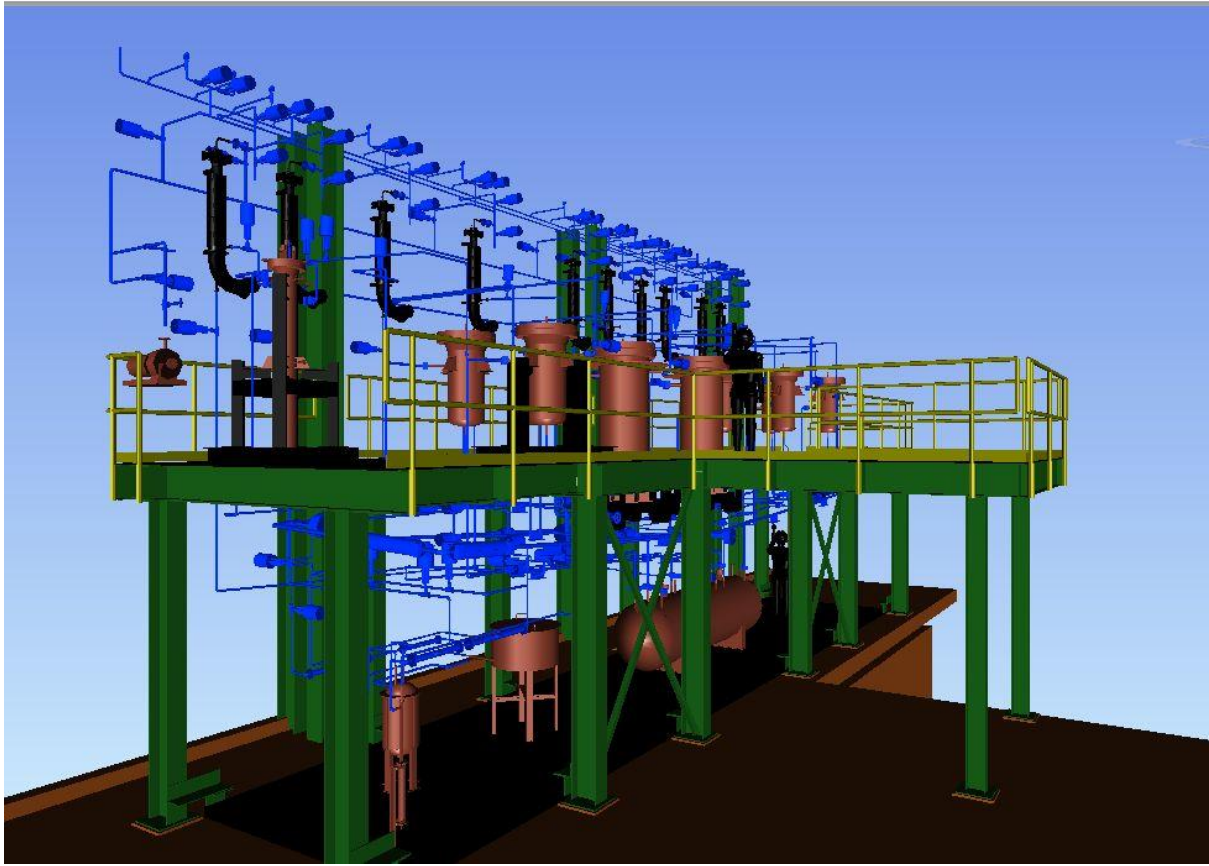


FIG. 2. View of the METL facility

Parameters table

Coolant inventory	800 [gal] of reactor grade sodium
Power	~ 1 [MW]
Test sections	
28" Vessel	<u>Characteristic dimensions</u> Inner Diameter = 27.25" Height = approx. 70" Capacity = approx. 170 gal
	<u>Static/dynamic experiment</u> Capable of both.
	<u>Temperature range in the test section (Delta T)</u> Static: Room Temperature - 1200°F Dynamic: 250 - 1000°F
	<u>Operating pressure and design pressure</u> Rated pressure: 100 PSIG @ 1200°F Operating pressure: approx. 15 PSIG
	<u>Flow range (mass, velocity, etc.)</u> Max flow rate: 10 GPM @ 1000°F
18" Vessel	<u>Characteristic dimensions</u> Inner Diameter = 17.25" Height = approx. 42" Capacity = approx. 40 gal

	<p><u>Static/dynamic experiment</u> Capable of both.</p> <p><u>Temperature range in the test section (Delta T)</u> Static: Room Temperature - 1000°F Dynamic: 250 - 1000°F</p> <p><u>Operating pressure and design pressure</u> Rated pressure: 100 PSIG @ 1000°F Operating pressure: approx. 15 PSIG</p> <p><u>Flow range (mass, velocity, etc.)</u> Max flow rate: 10 GPM @ 1000°F</p>
Coolant chemistry measurement and control (active or not, measured parameters)	<p>During operation a ~ 10 gal cold trap will be used to maintain the impurity levels within the flowing sodium to < 3 wppm. The nominal flow rate through the cold trap will be ~ 1 GPM, so the required time to clean the entire 800 gal sodium inventory will be 1-2 days.</p> <p>To ensure that the cold trap is operating as expected and to monitor for any impurity excursions during operation, METL is also equipped with a plugging meter capable of < 5 wppm resolution.</p> <p>As shown in the P&ID, the cold trap and plugging meter loops are configured so that they can be connected to the main loop in either series or parallel.</p>
Instrumentation	<p>Annular linear induction pump (ALIP) (0-10 GPM, 0-100 PSID) AC conduction pump (0-5 GPM, 0-7 PSID) Flowmeters</p> <p>Heaters Thermocouples</p> <p>Pressure transducers</p> <p>Differential pressure level sensor Inductive level sensor</p> <p>Argon cover gas & vacuum system</p> <p>High-temperature, sodium-compatible valves</p> <p>Moist-CO2 cleaning system</p> <p>Flexicask Carbonation system</p> <p>Plugging meter Cold trap Economizer (~27 [kW])</p>

COMPLETED EXPERIMENTAL CAMPAIGNS: MAIN RESULTS AND ACHIEVEMENTS

This facility is currently under construction. First test assembly will be to test advanced compact fuel handling system components.

PLANNED EXPERIMENTS (including time schedule)

The testing of the following sodium technologies can be accommodated in METL. The first planned experiments are associated with advanced compact fuel handling technology development and maturation. The following are some examples of potential planned experiments in METL.

Advanced compact fuel handling systems and components to include gripper, gear, and bearing technology

Flowmeter testing and calibration

Level sensor testing and calibration

Under-sodium viewing technology development and testing

Advanced Purification Testing Assembly – used for the testing of immersed cold traps and other advanced cold trap designs.

Friction/Welding Test Assembly

Advanced control rod drive system technology development

Advanced materials technology maturation and testing

TRAINING ACTIVITIES

REFERENCES (*specification of availability and language*)