

Advanced Manufacturing Office

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



Tools & Training

Technical Assistance Partnerships

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On behalf of Sandy Glatt

Advanced Manufacturing Office (AMO)

AMO Energy Tool Suite

Goals

- Tools allow users to perform field validation, model and optimize energy using equipment and systems in manufacturing (and other large energy using facilities)
- Open-source approach enables greater transparency, community adoption, and integration into future technologies (i.e. – “Internet of Things” devices, machine learning optimization, etc)
- Low-cost and unbiased means to:
 - Identify and analyze opportunities to improve and optimize current energy use
 - Identify opportunities for new or enhanced technology needs related to manufacturing energy use
 - Validate and verify new technology enhancements

AMO Resources: 3 Key Tool Focus Areas

Energy Performance Tracking

Baselining

Navigator & EnPI Tool

Corporate Energy Performance Tracking for Better Plants partnership

Facility Energy Performance Tracking for Superior Energy Performance

Energy Management

ISO 50001 Implementation

Energy Footprint Tool

PEP (Plant Energy Profiler)

Energy Systems Analysis

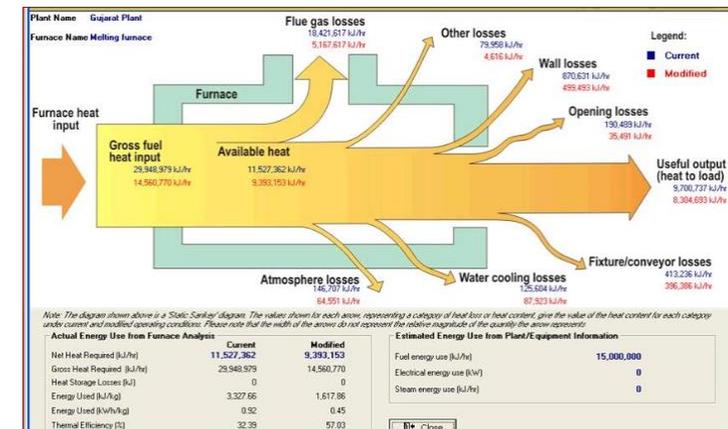
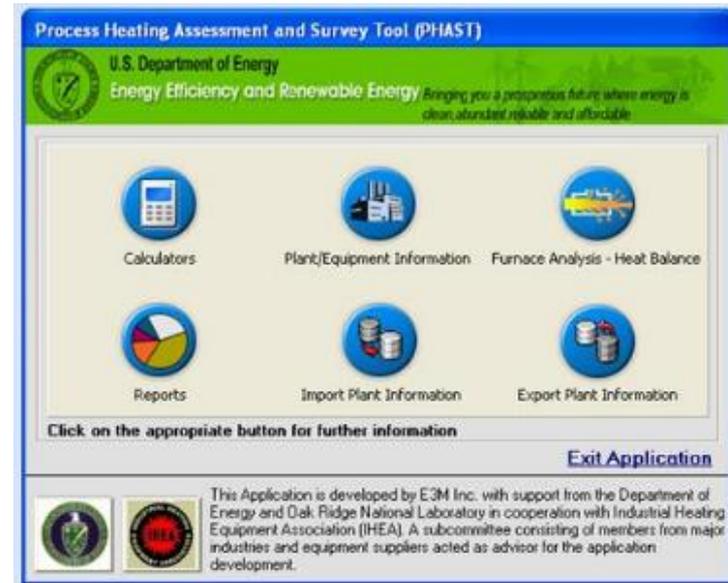
- Motors
- Pumps
- Fans
- Compressed Air
- Steam
- Process Heating
- Data Centers
- Simple Calculators

AMO Energy Tool Suite

- Energy System Tools
 - Pumps, fans, compressed air, steam, process heat and motors
- Energy Management Tools
 - *50001 Ready Navigator*: Free online guide to help develop a robust EnMS consistent with ISO 50001
 - *Energy Performance Indicator (EnPI Lite) Lite tool*: Free web-based, online tool to help a facility establish baseline of energy consumption and track annual progress of energy performance, energy savings, and energy performance indicators
 - *EnPI tool*: Free Excel-based, downloadable tool (offline) with the additional functionality of accounting for variables and performing more robust regression analysis compared to EnPI Lite
 - *Energy Footprint tool*: Helps manufacturing, commercial and institutional facilities to track their energy consumption, factors related to energy use, and significant energy end-use
 - *Automated Register of Implemented Actions*: Free Excel download to organize and track actions taken to implement an EnMS, including but not limited to ISO 50001 and SEP

AMO Tool Modernization Overview

- Issues:
 - Many tools no longer work with updated operating systems
 - DOE does not own software code
 - Difficult to fix bugs or add new capabilities
- Path Forward:
 - DOE will own and control code
 - Upgrade tool capabilities where feasible
- Create Open Source Software!
 - Government-wide Open Source Software <https://sourcecode.cio.gov/>
 - “...free Software for other public agencies as well as the general public to use, study, share and improve the software.”
 - MIT License – “Do whatever, but please provide attribution”



AMO Tool Modernization (cont.)

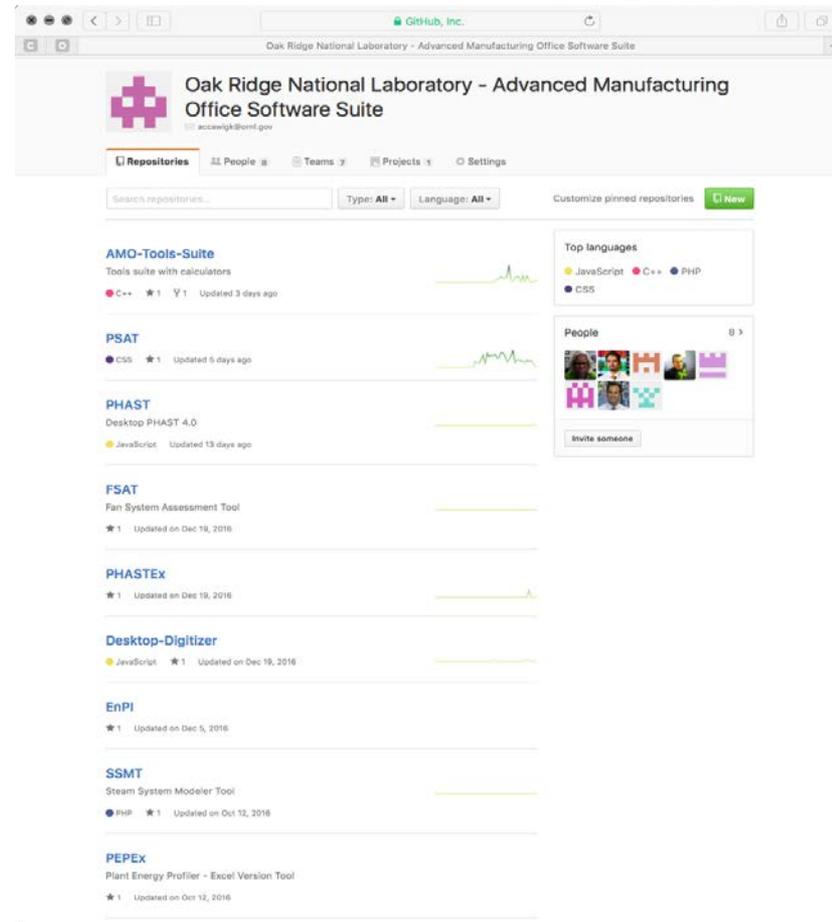
- Designed for Multiple interfaces
 - Web / Desktop / Mobile
- GitHub repository for Open Access
- <https://www.energy.gov/eere/amo/advanced-manufacturing-office-software-suite-github>
- Other Benefits:
 - Common software engine library
 - Auto-Update capability (silent updates)
 - Crash reporting to assist in debugging
 - Consistency in appearance across all platforms
 - Enhanced tool interoperability



Open-source code

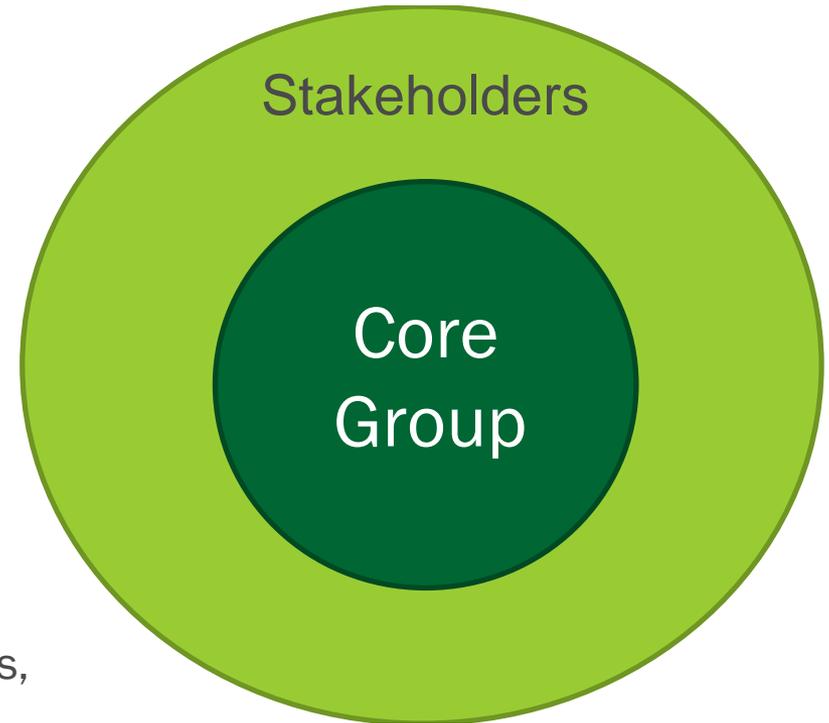


- Utilizing industry-recognized open-source code sharing platform
- GitHub.com - <https://www.energy.gov/eere/amo/advanced-manufacturing-office-software-suite-github>
- Provides versioning control
- Allows individuals to follow progress and push suggested modifications
- Repository Includes:
 - Source code, license info, configuration files, inline documentation utilizing doxygen



Development: Critical Community Engagement

- Core Development group
 - Review coding
 - Test Beta Tools
 - Includes original tool developers and practitioners
- General Stakeholders' group
 - General awareness
 - End users of tools
 - Includes stakeholders in other DOE technical programs (Better Plants partners, Industrial Assessment Centers, etc)
- Periodic meetings
 - Update on development plans
 - Review and assess



Tool Revamp Timeline

- Pumps (PSAT) - 6/30/2017 (alpha completed)
- Process Heat (PHAST 4.0) - 8/31/2017
 - (Excel version finalized) - **12/31/2016** (completed)
- Fans (FSAT) - 12/31/2017
- Compressed Air (AirMaster+) - 5/31/2018
- Steam (SSMT/SSAT) - 9/31/2018
- LogTool - 9/31/2018
- MotorMaster - TBD
- PEPEX - **3/20/2017** (completed)
- EnPI v5.0 - 6/30/2017
- 50001 Ready Navigator - **5/17/2017** (completed)
- EnPI-Lite - **5/31/2017** (completed)

Associated Tool Training Plans

- Online Tool Tutorials – Tool-use tutorials will be developed for each tool (online, video)
 - Resources embedded in the tools or otherwise available instructing users on how to use the tools
- In-Plant Training- Expanding deployment of In-Plant training curriculum (classroom/in-person)
 - System based and energy management with tool introduction
 - updated curriculum combining online and classroom modules with hands-on and participant interaction focus
- Expertise/ Certification Training - Explore 3rd party development and implementation of professional certifications in key systems
 - look to external organizations to develop and deliver (ex: Compressed Air Challenge, CAGI, IHEA)
 - Hydraulic Institute is completing a Pump System certification w/ associated curriculum
 - *Compressed Air Challenge* has Compressed Air System curriculum



Future Technology Leverage Opportunities

What will this effort help enable going forward?

- Open-Source Library Suite
 - Greater transparency
 - Future proofing
 - New algorithms can be added to characterize other plant processes and equipment
 - Equipment providers can develop equipment specific databases that interface with the tool
- Library can be used to effectively test real-world equipment performance versus theoretic capabilities
- Leverage sensors for real-time data collection, monitoring and optimization
 - Leverage the Internet of Things devices coming online within manufacturing
- Enable real-time system analysis and optimization
 - Possibilities for exploring machine learning algorithms for system optimization