GAGE
National Science Foundation's Geodetic Facility for the Advancement of Geoscience

Implementation of Lean Manufacturing Tools in Assembly of Scientific Instrumentation

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UNAVCO

INTRODUCTION

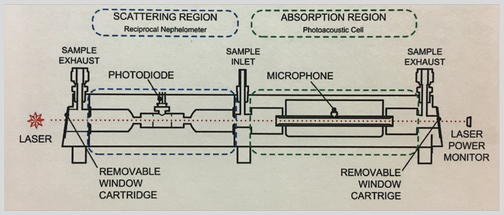
Droplet Measurement Technologies (DMT) is a company that manufactures instruments used for measuring water droplets, ice crystals, black carbon, single particles, and aerosols in the atmosphere.

Our project was to create lean manufacturing work instructions by utilizing PowerPoint for building the PAX 870 instrument. We also created pick lists and presentation kits for enhancing efficient productivity of the PAX 870 building process.

PAX INSTRUMENT

Figure 1. Research station (left photo); the PAX inside the research station (right photo). Photos courtesy of DMT.

The Photoacoustic Extinctiometer (PAX) is a device that measures aerosol optical properties relevant for climate change and carbon particle sensing, including black carbon. The instrument is suitable for fixed site, mobile or airbrone sampling.



The Heart of the Pax is the cell. The cell uses a modulated diode laser to simultaneously measure light scattering and absorption. The standard infrared, 870-nm wavelength option is highly specific to black carbon particles, since there is relatively little absorption from gases and non-BC aerosol species at this wavelength.

Figure 2. Drawing and description of the PAXs Cell. Courtesy of DMT.

WORKFLOW

STEP 1:

With observation and documentation, we assembled step-by-step work instructions per Droplet's templates. At end of the steps we created 600 PowerPoint slides. Each slide contains color coded text for tools (green), parts (blue), and notes (orange).

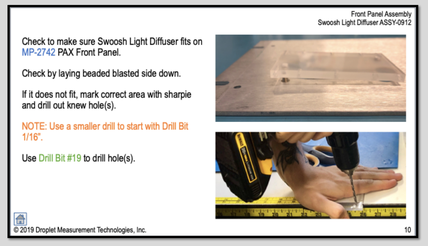


Figure 3. Laser & Final Assembly Instructions using PowerPoint.

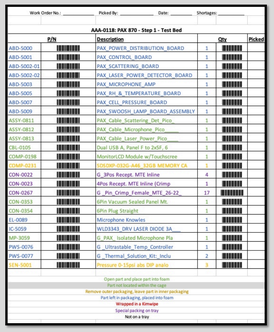


Figure 4. PAX 870 Pick List, created using Excel.

STEP 2:

Using Excel, we created a series of pick lists for each step of the PAX 870 build. These materials included quantities of assembly parts, connectors, cables, hardware, and tools. Color coding was applied to help sort for the Presentation Kit process.

Figure 5. PAX 870 Presentation Kits. Photo before (left) and after (right).

STEP 3:

By cutting out Presentation Kits, we designed and built tools in order to increase flow in the lean manufacturing process. With materials placed into the foam kits, it makes them fast to build and efficient.

LEAN MANUFACTURING

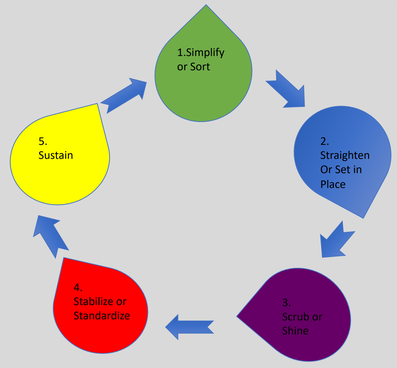


Figure 6. The 5 S's of lean manufacturing

By practicing lean manufacturing for creating work instructions, DMT can make scientific devices at a faster and efficient pace. Scientists can purchase devices and start collecting data more timely.

FUTURE WORK

Now that the PAX 870 work instructions, pick lists, and presentation kits are completed, DMT will continue creating lean manufacturing instructions for all of their scientific devices. DMT builds around 27 other devices and by employing these lean build instructions, devices can be built with quality.

These instrument can help study:

- Clouds microphysics
- Aircraft icing tests.
- Icing on wind turbines.
- Atmospheric ozone.
- Black carbon which contributes to effects of global warming.

ACKNOWLEDGMENT

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DROPLET MEASUREMENT TECHNOLOGIES

Geo-Launchpad

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