What goes into a PM program?

The short answer is that it depends on the type of facility, but there are some general components that are common to most PM programs, including:

- The critical equipment in a plant based on the cost of the equipment, cost of downtime, and/or cost of ruined output
- Data measurements for that equipment that are early indicators of degrading performance or product quality
- A schedule for equipment inspection
- A standard process for taking, comparing, and storing measurement data
- A process for acting upon early warning signs

Identifying:

- The critical equipment in a plant based on the cost of the equipment, cost of downtime, and/or cost of ruined output
- Data measurements for that equipment that are early indicators of degrading performance or product quality
- A schedule for equipment inspection
- A standard process for taking, comparing, and storing measurement data
- A process for acting upon early warning signs
for both overall vibration and bearing condition. This allows users, who may not understand the significance of the measurement numbers, to determine the severity of the problem. They can also upload data to a PC (or to the Fluke Cloud with Fluke Connect) for trending analysis to get a clear view of changing bearing condition and deteriorating health of the machine.

**Thermal Imaging sets the stage**
An infrared camera (also called a thermal imager) can provide an infrared view of your entire electro-mechanical system, capturing the temperatures of both critical components and the entire integrated unit. The dual images are accurately aligned, making it much easier to spot trouble areas.

Using an infrared camera to scan a broad area first, such as the bearing housings on motors, the switches in circuit breaker panels, or the wiring connections of equipment, will reveal differences in temperature that help you zero in on problem areas. High temperatures alone don’t necessarily mean trouble. However, if you see a component with a higher temperature than those around it, or you see the temperature of one component rise rapidly, you have good reason to look closer.

A coupling that is running warm could indicate misalignment. A hot spot at a connection point could mean a bad or loose connection. Abnormal heating on the electrical supply could mean a phase imbalance. In addition to helping you find a problem, an infrared scan can help you build a list of components to measure with other test tools such as a vibration tester or digital multimeter (DMM).

**Insulation testing detects potential failures**
Insulation problems on motors and drives are usually caused by excessive heat, improper installation, environmental contamination, mechanical stress, or age. Regular insulation testing can be combined with regular motor maintenance, to identify degradation.

An insulation multimeter like the Fluke 1587 combines insulation resistance testing with all of the most common digital multimeter functions making it the go-to tool for maintaining and troubleshooting motors. Checking motor windings, and line and load conductors at regular intervals, can help you detect deterioration before the motor fails so you can more accurately predict when to replace or restore the windings.

**Electrical testing**
DMMs and clamp meters take care of the standard voltage and amp measurements to help you detect a wide range of electrical problems that can contribute to a potential failure. Current unbalance is a common cause of motor overheating and can indicate power delivery problems or insulation

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**Checklist for setting up a smart-tool preventive maintenance program**

- Identify the most important pieces of equipment
- Identify critical measurement and inspection points. Common practices include:
  - Noncontact infrared: scanning the bearing housings on motors, switches in circuit breaker panels, and wiring connections at important equipment
  - Taking good/bad vibration readings at each bearing location along the drivetrain while the machine is running in a steady state and at normal operating temperature
  - Making quick voltage and current checks, against the balance and loading thresholds
- Adopt a smart phone maintenance app with cloud-based data management
- Set up equipment logs for each piece of equipment, with
  - A baseline for each type of measurement (thermal, electrical, vibration)
  - Frequency of inspection (ranges from 3 to 12 months)
  - Text or audio notes, with pictures if helpful, outlining any special setup needed to get an accurate comparison (how much load, etc.)
- Train the team on the app, equipment log, and how to use it during inspection (scheduled vs. troubleshooting)
- Implement quick periodic inspections using handheld tools such as multimeters, IR thermometers, and vibration pens that are designed for non-specialist technicians
resistance breakdown inside the motor windings. A voltage unbalance, of greater than two percent can also reduce equipment performance and cause premature failure.

A digital multimeter can also check resistance across most connections. High resistance readings can signal degraded connections, which can reduce supply voltage, and cause nuisance tripping, and potential equipment failure. High resolution DMMs can also measure resistance across relay and circuit breaker contacts to detect degrading contacts.

### Turning measurements into assets

Once all of these measurements are taken there is still the matter of how to manage that information to keep your equipment and systems running at their best. All of the tools mentioned here can record and store measurements, which you can upload to a PC for further analysis.

Fluke offers more than 20 Fluke Connect—enabled that you can use to collect measurements wirelessly and review input from multiple modules simultaneously on a smart phone. You can also store measurements and images for each piece of equipment in EquipmentLog™ history in a secure central database that can be accessed only by authorized team members. That way techs can access all the measurements and thermal images related to an asset on their smart phones from the field, compare them to the latest measurements, and determine whether there’s a trend-to-the-worse in performance indicators.

Techs already know how to use a smart phone and the test tools so training isn’t an issue. Fluke Connect also supports knowledge sharing—among individuals and between individuals and the organization—which can expedite preventive maintenance, reduce unplanned downtime, and extend equipment life thus enhancing your operation as a whole.