eSTPE & Steam Path Audits

Summary of Steam Path Audit Graphs

This is a continuing discussion of April's topic of steam path audit graphs.

Q. How is the information that the eSTPE™ graphs provide intended to be used?

A. These graphs provide graphical methods to review casing clearance trends and to check input data. An example of a trend that would be quickly recognizable from the clearance graphs is an increasing clearance on the bottom or top of a casing, even though the left and right sides of the casing may show no significant deviation in clearance. The graphs also provide a check for data that does not fit the trend. If the stages of a casing follow a trend, but one piece of data does not seem to fit, the data can be reviewed to assure correct measurement and input of that data.

In eSTPE, the user enters the left and right clearances at the horizontal joint, tooth heights around the circumference of the packing, and ellipticity and spring measurements, to get a better representation of the overall flow area than clearances alone can supply. The clearances at the top and bottom of the casing, because of rotor "rub" or erosion, may be significantly larger than clearances at the sides of the casing, which may be near design. As an example, if the packings in a casing have experienced a bottom rub during operation, the flow through that packing could be as much as 40 percent higher than the design due to increased clearance on just the bottom of the packing.

Patterns observed from the packing graphs show relative top-to-bottom and side-to-side wear patterns to help improve understanding of the cause of the wear, and the corrections that may be used to reduce packing wear in the future.

Differences in temperature of the top and bottom of the casing can cause casing distortion during hot or still-warm starts and during stops if not performed to manufacturer's specifications. Distortion can also be the result of material creep from operating at high temperatures and pressures over a long period of time.

Some typical causes for uneven top-to bottom or side-to-side wear patterns are:

- Rotor to casing misalignment.
- Response of the rotor to unbalance, especially when passing through critical speeds.
- Differences in temperature between the steam and casing during hot or still-warm starts.
- Differences in the vertical thermal expansions of the supports of the casing and of the rotor.

Practices that can reduce instances of uneven packing wear patterns include:

- Careful alignment of the stationary blade rows and inner casings.
- Careful balancing of the turbine rotor.
- Careful placement of insulation applied to the casing and to the connections of the extractions.
- Adherence to recommended start-up procedures.