

eSTPE & Steam Path Audits

Vertical Clearance

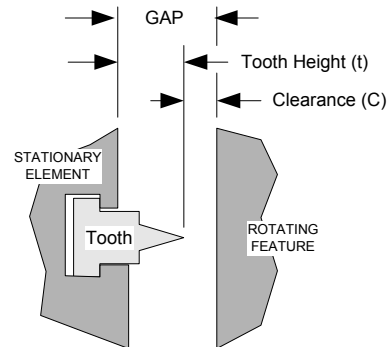
Q. How is the top and bottom vertical clearance determined?

A. To calculate the packing clearance at any position other than the horizontal joint, the eSTPE program will first establish the packing GAP.

The packing GAP is the distance between the rotor or rotating feature and the base of the measured tooth. The gap (GAP) is calculated from the left and right clearances (C) and tooth heights (t) measured at the horizontal joint.

$$GAP = \frac{1}{2} [(C_R + t_r) + (C_L + t_L)]$$

The top and bottom vertical clearances are the Gap minus the top or bottom tooth height.



The GAP is also necessary to calculate packing losses. The average clearance (C_{ave}) is calculated from the packing GAP and eight tooth height measurements around the circumference of the packing.

$$C_{ave} = \frac{1}{8} \sum_{i=1}^8 (GAP - t_i)$$

The average clearance is now used to determine the leakage area and make a comparison with the design clearance to calculate the loss.

Clearance & Tooth Height Measurements

Q. The outage crew always measures the radial clearances when they chart the rotor. Can these measurements be used for the steam path audit?

A. Usually not. Even though outage crews do an excellent job recording the clearances, steam path audit measurements are taken for an entirely different reason as discussed above. When conducting a steam path audit care must be taken while measuring multiple toothed packings to always measure the height of the same tooth that was used to measure the clearance. The tooth height measurements should also be taken on the same side of the tooth i.e. upstream or downstream.

To decide which tooth to measure:

- Choose a tooth that throttles steam. Some teeth will not throttle steam because axial thermal expansion of the rotor at high temperature will move them away from the landing.
- Choose a tooth that represents other teeth within the group. Do not choose a tooth that has been damaged or bent at the horizontal joint.
- Choose a tooth with a smooth surface at the base of the tooth. This will give the most consistent tooth height measurements. Some teeth are held in place with caulking on one side that often results in an irregular base and therefore an inaccurate tooth height reading.