



AEROSPACE RECOMMENDED PRACTICE

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INVOLUTE SPLINES; WEAR LIMIT, DEFINITION OF

1. PURPOSE

To provide a recommended practice covering the method criteria for defining "wear limit" on involute splines.

2. SCOPE

This recommended practice is applicable to all involute splines used in Aerospace Propulsion Units.

3. GENERAL

There is no uniformity in the Aerospace Industry in the method of establishing the "wear limit" for involute splines. Some sectors of the industry define this "wear limit" as a chordal dimension measured on the pitch circle. Still other sectors define the "wear limit" as a dimension measured normal to the involute profile at the pitch circle. Likewise, due to the lack of an accurate method of measuring involute spline wear, previous attempts at specifying "wear limits" incorporated an allowance for these inaccuracies. The "wear limit", when measured with the device described in ARP 1111, does not require consideration of manufacturing tolerances on tooth thickness and space width. Therefore, a more realistic approach is now possible when establishing the "wear limit" for a given involute spline application. The intent of this recommended practice is to define the phrase "wear limit" and to state the important factors which must be taken into consideration when specifying spline wear limits.

4. METHOD

- 4.1 The reference circle from which all transverse spline tooth dimensions are constructed is the pitch circle. Accordingly, the "wear limit" shall be defined as a dimension on the pitch circle for each specific spline application (both internal, and external involute splines).
- 4.2 "Wear limit" shall be defined as the amount of tooth thickness decrease for an external involute spline, or the amount of space width increase for an internal involute spline which may be considered allowable without expectation of failure.
- 4.3 "Wear step" shall be defined as a circular dimension measured on the pitch circle, as displayed in Figure 1.

5. CONSIDERATIONS

- 5.1 The paramount reason for establishing a "wear limit" for any given involute spline is to ensure removal of worn parts from service well in advance of possible failure and subsequent loss of an Aerospace System. Therefore, an assessment must be made to determine the amount of material loss that can be tolerated and have the coupling remain structurally sound.
- 5.2 Material Properties: An important factor which must be given consideration is the material properties of the coupling. Points of particular interest are the load carrying capabilities of the material, the case hardness, case depth, and operational experience. For most materials the wear rate greatly accelerates upon penetration of the hardened case; therefore, the "wear limit" must account for or limit case penetration.

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