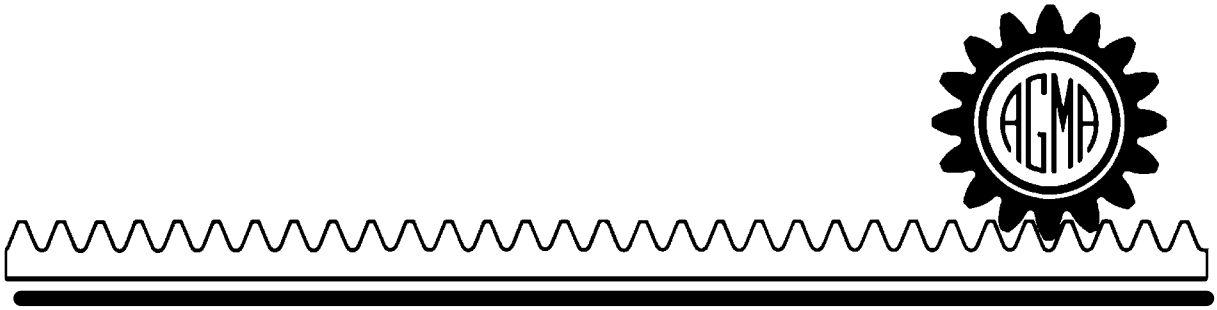
ANSI/AGMA 1010-E95
(Revision of AGMA 110.04)

AMERICAN NATIONAL STANDARD

Appearance of Gear Teeth - Terminology of Wear and Failure

ANSI/AGMA 1010-E95



AGMA STANDARD

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Approved December 13, 1995

ABSTRACT

This nomenclature standard identifies and describes the classes of common gear failures and illustrates degrees of deterioration.

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Foreword

[The foreword, footnotes, and annexes, if any, are provided for informational purposes only, and should not be construed as part of American Gear Manufacturers Association Standard ANSI/AGMA 1010–E95, *Appearance of Gear Teeth – Terminology of Wear and Failure*].

This standard provides a means to document the appearance of gear teeth when they wear or fail. The study of gear tooth wear and failure has been hampered by the inability of two observers to describe the same phenomenon in terms that are adequate to assure uniform interpretation.

The term “gear failure” is subjective and a source of considerable disagreement. For example, a person observing gear teeth that have a bright, mirrorlike appearance may believe that the gears have “run–in” properly. However, another observer may believe that the gears have failed by polishing wear. Whether the gears should be considered failed or not depends on how much wear is tolerable.

This standard provides a common language to describe gear wear and failure, and serves as a guide to uniformity and consistency in the use of that language. It describes the appearance of gear tooth failure modes and discusses their mechanisms, with the sole intent of facilitating identification of gear wear and failure. The purpose of the standard is to improve communication between equipment users and gear manufacturers for failure and wear analysis. Since there may be many different causes for each type of gear tooth wear of failure, it is not possible in the standard to identify a single cause for each type of wear or failure, nor to prescribe remedies.

AGMA Standard 110 was first published in 1943. A revised standard, AGMA 110.03, was published in 1979 with improved photographs and additional material. AGMA 110.04 was reaffirmed by the members in 1989.

ANSI/AGMA 1010–E95 is a revision of AGMA 110.04. This version was approved by the AGMA Membership in March 9, 1995. It was approved as an American National Standard on December 13, 1995.

Suggestions for the improvement of this standard will be welcome. They should be sent to the American Gear Manufacturers Association, 1500 King Street, Suite 201, Alexandria, Virginia, 22314.

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American National Standard -

Appearance of Gear Teeth - Terminology of Wear and Failure

1 Scope

This standard provides nomenclature for general modes of gear tooth wear and failure. It classifies, identifies, and describes the most common types of failure and provides information which will, in many cases, enable the user to identify failure modes and evaluate the degree or progression of wear.

This standard is based on experience with steel gears; however, many of the failure modes discussed may apply to gears made from other materials.

The solution to many gear problems requires detailed investigation and analysis by specialists and is beyond the scope and intent of this standard.

This standard does not define “gear failure”. One observer’s “failure” is another observer’s “run-in”. There is no single definition of gear failure, since whether or not a gear has failed depends on the specific application.

2 Nomenclature

2.1 Definitions

The terms used in this standard, wherever applicable, conform to the definitions given in the following standard:

ANSI/AGMA 1012-F90, *Gear Nomenclature, Definitions of Terms with Symbols*

2.2 Symbols

NOTE: The symbols and definitions used in this standard may differ from other AGMA Standards. The user should not assume that familiar symbols can be used without a careful study of these definitions.

2.3 Classes and modes of failure

Table 1 groups the common modes of gear failure into seven general classes and subdivides the general classes into general and specific modes. It also includes commonly used, but not preferred names.

3 Wear

Wear is a term describing change to a gear tooth surface involving the removal or displacement of material, due to mechanical, chemical, or electrical action.

Figures 1 and 2 show mild and moderate wear. They are not intended to indicate the mode of wear.

Wear can be categorized as mild, moderate or severe. Mild wear is considered normal in many applications. Moderate and sometimes even severe wear may be acceptable in some applications.

3.1 Adhesion

Adhesion is caused by transfer of material from one tooth surface to another due to microwelding and tearing. It is confined to surface films and oxide layers on the tooth surface.

Adhesion can be categorized as mild or moderate. Severe adhesion is termed scuffing (see clause 4).

3.1.1 Mild adhesion

Mild adhesion typically occurs during running-in and usually subsides after it has smoothed the tooth surfaces by removing minor imperfections through local wear. To the unaided eye, the tooth surface appears undamaged and the original machining marks are visible. Microscopically, smooth microplateaus can be seen between the machining furrows.

3.1.2 Moderate adhesion

Adhesion is classified as moderate if it removes some or all of the original machining marks from the active surface of the tooth. Under certain conditions, adhesion may cause continuous removal of surface films and oxide layers, resulting in severe wear.