American Gear Manufacturers Association

Technical Resources

ANSI/AGMA 1010-F14
(Revision of ANSI/AGMA 1010-E95)

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American National Standard

Appearance of Gear Teeth - Terminology of Wear and Failure

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ANSI/AGMA 1010-F14
[Revision of ANSI/AGMA 1010-E95]

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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, in this document are provided for informational purposes only and are not to be construed as a part of ANSI/AGMA 1010-F14, *Appearance of Gear Teeth - Terminology of Wear and Failure.*]

This standard provides a means to describe 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 change from original condition 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 or 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 was a revision of AGMA 110.04. It was approved by the AGMA Membership in March 9, 1995. It was approved as an American National Standard on December 13, 1995.

ANSI/AGMA 1010-F14 is a revision of ANSI/AGMA 1010-E95. It merges ANSI/AGMA 1010-E95 and AGMA 912-A04. New failure modes and additional photos were added and the content was reorganized. The description of failure mode morphology and mechanism was expanded, and methods to reduce the risk of a particular failure mode were added to the description of many of the failure modes.

The first draft of ANSI/AGMA 1010-F14 was made in August, 2010. It was approved by the AGMA membership in June, 2014. It was approved as an American National Standard on August 8, 2014.

Suggestions for improvement of this standard will be welcome. They may be submitted to tech@agma.org.

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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 that will, in many cases, enable the user to identify failure modes and evaluate the degree or change from original condition.

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.

The methods given for reducing the risk of a failure mode are specific to the failure mode considered, and implementation may sometimes worsen, or create other failure modes or unintended consequences. Therefore, it is imperative that any remedy be evaluated prior to implementation and thoroughly tested and evaluated after implementation.

NOTE: “gear” throughout the standard means gear or pinion unless the gear is specifically identified.

2 Normative references

The following documents contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions were valid. All publications are subject to revision, and the users of this standard are encouraged to investigate the possibility of applying the most recent editions of the publications listed:

AGMA 901-A92, *A Rational Procedure for the Preliminary Design of Minimum Volume Gears*

AGMA 923-B05, *Metallurgical Specifications for Steel Gearing*

ANSI/AGMA 1012-G05, *Gear Nomenclature, Definitions of Terms with Symbols*

ANSI/AGMA/AWEA 6006-A03, *Standard for Design and Specification of Gearboxes for Wind Turbines*

ANSI/AGMA 6011-I03, *Specification for High Speed Helical Gear Units*

ANSI/AGMA 6013-A06, *Standard for Industrial Enclosed Gear Drives*

ANSI/AGMA 9005-E02, *Industrial Gear Lubrication*

ISO 14104, *Gears - Surface temper etch inspection after grinding*

3 Definitions

3.1 Definitions

The terms used in this standard, wherever applicable, conform to the definitions given in ANSI/AGMA 1012-G05 and AGMA 923-B05.

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.

