AN AMERICAN NATIONAL STANDARD

ASME
PTC 6A-2000

[Revision of ANSI/ASME
PTC 6A-1982 (R1988)]

REAFFIRMED 2016

Appendix A to PTC 6, The Test Code for Steam Turbines

PERFORMANCE
TEST CODES

The American Society of
Mechanical Engineers

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Date of Issuance: July 2, 2001

This document will be revised when the Society approves the issuance of the next edition. There will be no Addenda issued to ASME PTC 6A-2000.

Please note: ASME issues written replies to inquiries concerning interpretation of technical aspects of this document. PTC 6A-2000 is being issued with an automatic subscription service to the interpretations that will be issued to it up to the publication of the 2005 edition.

The American Society of Mechanical Engineers
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FOREWORD

ASME Performance Test Code 6 on Steam Turbines (PTC 6-1996) states that numerical examples of corrections to test performance for the effect of deviations of operating conditions from those specified are given in a separate publication of the PTC 6 Committee. This Appendix, PTC 6A, Sample Calculations, fulfills the Committee's obligation as stated in the Code.

The 1996 version of the Steam Turbines (PTC 6) incorporates the Interim Test Code for an Alternative Procedure for Testing Steam Turbines (PTC 6.1-1984) with the 1976 version of the Test Code. This Appendix provides sample calculations using both methods for a reheat regenerative cycle turbine. In addition, sample calculations have been added for a non-reheat regenerative cycle turbine, an automatic extraction condensing cycle turbine, a refurbished low pressure turbine, and determination of the coefficient of discharge of a throat-tap nozzle. Instrumentation listed has been updated to reflect those currently used.

This newly revised Appendix to the Test Code, now named Appendix A to Test Code for Steam Turbines, PTC 6A-2000, was approved by the Board on Performance Test Codes on July 14, 2000.

It was approved as an American National Standard by the Board of Standards Review on November 17, 2000.

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NOTICE

All Performance Test Codes **MUST** adhere to the requirements of **PTC 1, GENERAL INSTRUCTIONS.** The following information is based on that document and is included here for emphasis and for the convenience of the user of this Code. It is expected that the Code user is fully cognizant of Parts I and III of PTC 1 and has read them prior to applying this Code.

ASME Performance Test Codes provide test procedures which yield results of the highest level of accuracy consistent with the best engineering knowledge and practice currently available. They were developed by balanced committees representing all concerned interests. They specify procedures, instrumentation, equipment operating requirements, calculation methods, and uncertainty analysis.

When tests are run in accordance with this Code, the test results themselves, without adjustment for uncertainty, yield the best available indication of the actual performance of the tested equipment. ASME Performance Test Codes do not specify means to compare those results to contractual guarantees. Therefore, it is recommended that the parties to a commercial test agree **before starting the test and preferably before signing the contract** on the method to be used for comparing the test results to the contractual guarantees. It is beyond the scope of any code to determine or interpret how such comparisons shall be made.

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(The following is the roster of the Committee at the time of approval of this Appendix.)

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SECTION 1 — INTRODUCTION

(a) This Appendix has been prepared to facilitate the calculation and correction of turbine test results by furnishing numerical examples of the procedures outlined in *The Performance Test Code on Steam Turbines* (PTC 6-1996). The feedwater heating cycles and gland leakoff systems have been simplified by avoiding unnecessarily long or repetitive calculations while still demonstrating the basic principles involved. Section 3 of this Appendix gives general guidance for making these calculations and comparisons to specified performance.

(b) Throughout this publication, the assumptions regarding turbine performance and the numerical values of corrections are hypothetical and should not be considered applicable to any particular unit.

(c) Except with written agreements to the contrary, the latest edition of the ASME Steam Tables, *Thermodynamic and Transport Properties of Steam* and its enthalpy-entropy diagram (Mollier chart), shall be used in the calculation of test results. When computers are used, they may link to compiled versions of the source code as supplied with the steam tables. As of January 1999 a new set of steam properties formulations, referred to as IAPWS IF-1997, became the international standard for calculations in the power industry. The IF-1997 formulations now supersede the IFC-1967 formulations that were used for the preceding three decades.

Steam turbine performance tests based on heat balances utilizing the IFC-1967 formulations, no matter when conducted, must still use the IFC-1967 formulations.

The numerical examples in this document are based on the use of the IFC-1967 formulations, as they merely demonstrate a computational procedure. In actual tests, the users must decide on the formulations appropriate for their circumstances.

(d) It is ASME policy that "all works, papers, and periodicals published by the Society shall require units to be in the International System (SI)." In response to that policy, all results are shown in both units, and a calculation example of a complete expansion condensing turbine is provided in U.S. Customary units (Section 6) and SI units (Section 6a).

(e) Performance Test Code 6 on Steam Turbines (PTC 6-1996) is the basic reference for this Appendix and will be termed "the Code" in further references herein. Reference should also be made to the *ASME Performance Test Code Supplements on Instruments and Apparatus* (PTC 19 Series) for guidance in the selection, installation, and use of instrumentation.

(f) The numerical calculations shown in Sections 6 through 13 in this Appendix have been computed in sufficient detail to illustrate the technique involved. In many instances, intermediate steps that lead to the final answer have been included using assumed guidelines for roundoff and number of significant figures. The reader is cautioned that the use of different guidelines or computational procedures may result in slightly different values but should have negligible effect on the results of a test.