ATTACHMENT 486
STEAM TURBINES COURSE SUPPLEMENTS AND REFERENCES
Compiled by
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COGEN FOR AFRICA PROJECT
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# Table of Contents

1. **Introduction** ........................................................................................................................................ 3  
   1.1 Course outline .................................................................................................................................. 3  

2. **Steam turbines for modern fossil-fuel power plants** ............................................................................. 4  

3. **Blade design and analysis for steam turbines** ...................................................................................... 5  
   3.1 Contents .......................................................................................................................................... 5  

4. **Operator’s guide to general purpose steam turbines: an overview of operating principles, construction, best practices, and troubleshooting** .................................................................................. 6  
   4.1 Contents .......................................................................................................................................... 6  

5. **Design considerations for a two-phase turbine** .................................................................................... 7  

6. **Qingdao Quickleader International trade co. Ltd** .................................................................................. 8  

7. **U Save Energy Systems LLP** .............................................................................................................. 9  

8. **Tgm Kanis Turbinen** ............................................................................................................................ 10  

9. **Elliott Steam Turbines** ....................................................................................................................... 11
1 Introduction
The following is a list of books and websites used as reference to create the steam turbines training course.

1.1 Course outline
Introduction
Principle of operation
Classification of steam turbines
Impulse turbines
Reaction turbines
Comparison between impulse and reaction turbine
Industrial applications
Thermal and Nuclear Power Generation
Power generation from biomass and waste incineration
Petrochemical Plant
Ships
An example Steam Turbine brochure- Mitsubishi HP condensing steam turbine
2 Steam turbines for modern fossil-fuel power plants

Title: Steam turbines for modern fossil-fuel power plants

Author: A Sh Leizerovich

Year: 2008

Publisher: Lilburn, GA: Fairmont Press; Boca Raton, FL: Distributed by Taylor & Francis/CRC Press

Abstract

Presenting various approaches to the design and operation of steam turbines, this book explores modern techniques for refurbishment of aging units. It describes and evaluates the important design and operational improvement opportunities for the full spectrum steam turbines - from the newest and advanced to the common systems.

Contents

Steam turbines in the modern world --
Rise of steam turbine output and efficiency with steam parameters --
Configuration of modern power steam turbines --
Design of steam path, blading, gland seals, and valves --
Last stage blades and exhaust hoods of LP cylinders --
Thermal expansion, bearings, and lubrication --
Operating conditions and start-up systems for steam-turbine power units --
Experimental and calculation researches of turbine transients --
Start-up technologies as applied to different start-up systems --
Start-up instructions for steam-turbine power units and their improvement --
Scheduled and unscheduled load changes within and beyond the governed range --
Cycling operation and its influence on turbine performances --
Automated data acquisition and control systems for modern power plants --
Diagnostic monitoring of turbine heat-rate and flow-capacity performances --
Diagnostic monitoring of turbine temperature and thermal-stress states --
Post-operative analysis of the turbine's operating conditions --
Assessment and extension of steam turbine lifetime --
Steam turbine upgrade --
Appendixes: List of abbreviations and symbols --
Acronyms --
Symbols --
Subscripts and superscripts --
Criteria of similarity --
Conversion table for main units used.
3 Blade design and analysis for steam turbines

Title: Blade design and analysis for steam turbines

Author: Murari P Singh; George M Lucas

Year: 2011

Publisher: New York: McGraw-Hill

Abstract

"THE LATEST STEAM TURBINE BLADE DESIGN AND ANALYTICAL TECHNIQUES

Blade Design and Analysis for Steam Turbines provides a concise reference for practicing engineers involved in the design, specification, and evaluation of industrial steam turbines, particularly critical process compressor drivers. A unified view of blade design concepts and techniques is presented. The book covers advances in modal analysis, fatigue

3.1 Contents

Introduction --

Steam turbine design process, performance estimation, and determination of blade loads --

Turbine blade construction, materials, and manufacture --

System of stress and damage mechanisms --

Review of fundamentals of vibration --

Damping concepts --

Vibration behavior of bladed disk system --

Reliability evaluation for blade design --

Estimation of risk --

Appendix: Fourier series.
4 Operator's guide to general purpose steam turbines: an overview of operating principles, construction, best practices, and troubleshooting

Title: Operator's guide to general purpose steam turbines: an overview of operating principles, construction, best practices, and troubleshooting

Author: Robert X Perez; David W Lawhon

Year: 2016

Publisher: Hoboken, New Jersey : John Wiley & Sons ; Salem, Massachusetts : Scrivener Publishing,

Abstract

When installed and operated properly, general purpose steam turbines are reliable and tend to be forgotten, i.e., out of sound and out of mind. But, they can be sleeping giants that can result in major headaches if ignored.

4.1 Contents

Introduction to steam turbines --

General purpose back pressure steam turbine --

Routine steam turbine inspections --

Steam turbine speed controls and safety systems --

The importance of operating procedures --

Overspeed trip testing --

Centrifugal pump and centrifugal compressor start-ups with a steam turbine driver --

Centrifugal pump and centrifugal compressor shutdowns with a steam turbine driver --

Installation, commissioning and first solo run --

Reinstating steam turbine after maintenance --

Steam turbine reliability --

Introduction to field troubleshooting --

Steam turbine monitoring advice --

Beyond start-ups, shutdowns, and inspections.
5 Design considerations for a two-phase turbine.

Title: Design considerations for a two-phase turbine.


Year: 1978


Abstract

A two-phase turbine, using a low-quality steam-water mixture as a working fluid, was designed, built, and tested in the laboratory. Two-phase fluids are found naturally in most geothermal fields throughout the world and can also be used in the conversion of waste heat from industrial sources. The thermodynamic and fluid-dynamic properties of such fluid mixtures are reviewed, with specific reference to the selection and design of an appropriate expander. Various types of practically realizable expanders are considered, and the choice of a single-stage, axial-flow, impulse turbine is explained. Also the basic design parameters, including sizing and blade and nozzle geometry, are described.
6 Qingdao Quickleader International Trade Co. Ltd

Qingdao Quickleader International trade co. Ltd was founded to help power plant owner solve spare parts problems. Through many years within design, procurement, maintenance and overhaul of overseas power plants, Qingdao Quickleader has achieved an extensive experience to identify the right specification spare parts and supply to power plants.

Due to the volume of parts and equipment handled by Qingdao Quickleader from its wide range of business relationship with Chinese famous manufacturers, the company is able to deliver spare parts at competitive prices with or without technical support our spare parts can be tailored to suit any power plant. Thus the company is able to find exactly same spare parts from original suppliers avoiding mistake or unsuitable with facility’s equipment.

Competitive advantages for the plant owner offered by the Qingdao Quickleader International Trade Company:

• Spare Parts Supply Agreements with Qingdao Quickleader will ensure delivery of spare parts in due time and save administration in owners organization.
• Quote of as per the cross confirmation of drawing, Sr.No. And technical specification, to make sure quotation no mistake.
• Coordinated handling of complete spare parts packages at competitive prices according to Quickleaders one-stop-shopping concept delivered to any address in the world.
• Arrangement of reconditioning of parts and components at original manufacturers.

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U Save offers the world’s efficient technologies serving plant utilities and process needs in the area of compression, steam generation & distribution and power generation, through products from its leading principal companies. Customers benefit from more than 20 years of experience of U Save team and its business partners in steam, compression and power generation. The company’s clients are assured of the best knowledge, engineering, reliable product, execution and service support throughout the life cycle of the products, starting from concept to commissioning.

U-Save Energy Systems LLP offers Steam turbine generator set from 5 KW to 30 MW, using low pressure saturated steam. The low pressure steam turbines are useful for generating power in addition to reduction in pressure against conventional method of using pressure reducing station. Complete captive power plant and co-gen plant can be supplied by our principals on turnkey basis.

Contacts
Overview: U-Save Energy Systems LLP Compressors : Sales & Services Kobelco (Kobe Steel Group), Japan, Armstrong International India & SIAD (Praxair Group), Italy

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Tgm Kanis Turbinen

Turbine Generator Maintenance, Inc. (TGM) was founded in 1986 as a steam turbine generator maintenance company. The company has seen exponential growth over the past 30+ years, ultimately becoming the premier alternative to the OEM for non-union turbine services. In 2001, TGM added a combustion turbine service division, and a generator service division was added in 2009 – becoming a complete turnkey service provider.

For more than a quarter of a century, TGM has performed turnkey inspections on steam turbine generator units of most all OEM manufacturers. TGM supplies the technical direction, project management, project coordination, supervision, labor, tooling, repairs, parts sourcing, and start-up support for these outages, bringing you a total turn-key package. The company is this able to service the entire turbine generator unit: controls, auxiliaries, gearboxes and generator as well as steam path components.

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Sales
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9 Elliott Steam Turbines
Combining engineering expertise, rugged designs and precision manufacturing, Elliott steam turbines are built to perform and endure years of continuous service. These powerful workhorses provide exceptional value and performance in a broad range of mechanical and power generation applications, around the clock and around the globe, in environments of every extreme. With power requirements, steam conditions and speeds constantly rising, Elliott has continued to develop its steam turbine product lines to meet ever more challenging operating conditions. Elliott steam turbines are rated for inlet steam conditions up to 2000 psig/1005 degrees F and speeds up to 20,000 rpm.
Elliott steam turbines come in a variety of sizes ranging from small, 20 hp (15 kW) single stage units, to large 135,000 hp (100,000 kW) multi-valve, multi-stage extraction condensing units. These units can be built to API standards and can be customized to meet exacting customer specifications. With a large selection of both standard and engineered steam turbines and turbine generator sets, Elliott steam turbines boost production in industries as diverse as oil and gas, chemical and petrochemical, pulp and paper, power generation and food processing.

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