



Course Information Letter ---- TG302

TURBINE GENERATOR ALIGNMENT WORKSHOP TG302

Proper alignment of turbine-generator components can be achieved when one has a thorough understanding of the necessary skills and procedures. Improper alignment causes outage extensions, forced outages, loss of efficiency, and in the worst-case catastrophic failure. The person responsible for the turbine outage may have to completely depend on the contractor or OEM representative's recommendations concerning turbine-generator alignment.

This three-day course was developed to provide the attendee with a thorough understanding of the concepts and procedures involved in TG alignment. The course will provide the attendee with the knowledge and practical hands on skills to properly plan, schedule, and administer a TG alignment program. The attendee will also have the skills and knowledge necessary to evaluate alignment recommendations provided by others. Steam turbine generator facility maintenance supervisors, mechanics, engineers, and all other plant personnel who are responsible for turbine-generator maintenance should attend.

Technical content of this course covers material similar to that covered in our Steam Turbine Generator Maintenance course, TG301. This course, however, utilizes extensive "Hands-On" laboratory exercises on actual turbine components and simulators to reinforce the knowledge gained in the classroom exercises. Alignment methods demonstrated are tight wire and rim and face method for couplings. Mandrels and lasers are discussed.

OBJECTIVES: Upon completion of this course, participants will be able to:

1. Describe the impact of various alignment problems on turbine efficiency and reliability.
2. Determine the correct alignment for your turbine-generator.
3. Describe the procedures for collecting and recording critical internal alignment data.
4. Describe the process of evaluating the collected internal alignment data.
5. Calculate and move internal stationary or rotating components to correct for misalignment.
6. Describe the procedure for collecting and recording critical shaft alignment data
7. Describe the process of evaluating the collected shaft alignment data.
8. Calculate and move shafts to correct for misalignment.
9. Describe the advantages and disadvantages of tight-wire, laser, and mandrel alignment.

FREQUENTLY ASKED QUESTIONS

- Will HPC Technical Services bring this course to our location for our personnel only? YES, call or email Stephen Parker, stparker@hpcnet.com for a price quotation.
- Will HPC Technical Services customize the presentation at our site to suit our particular needs? Yes.
- Is HPC Technical Services' textbook available for purchase as a reference document? No, but our fully color illustrated Steam Turbine Generator Maintenance text, TG301, is available. \$219 + S&H.
- What is the cost for HPC Technical Service to deliver this course at our location? Well, of course that can vary and it needs to be priced on an individual need basis. You gain from the customization and price.
- Are HPC Technical Services' consultants available for "technical advice" during our upcoming outage? Yes. Call Harold Parker, hparker@hpcnet.com for a rate sheet.

COURSE OUTLINE

Day One

Introduction

Provisions for Alignment: Reference Data, Support Structures, Locating Structures, and Expansion

Alignment Checks (Disassembly): Rotor Position, Coupling Alignment, Joint Opening, Shell Arm Loading, Rotor Clearance Measurement (Charting), Shell/Casing Charting (For Topless Align.), and Diaphragm/Blade Ring Position

Diaphragm/Blade Ring Alignment: Tight-Wire Alignment, Wire Set up, Taking Data, Normalized Readings, True Position, Determine Misalignment, Making the Move, Tops On Corrections, Elliptical Bore Corrections, Laser Alignment, Mandrel Alignment, Diaphragm Preliminary Checks, Diaphragm/Blade Ring Moves

Day Two

Internal Alignment Workshop: Hands-On Tight-Wire Alignment Problems, Hands-On Laser Alignment Problems

Shaft/Coupling Alignment: Types of Misalignment, Taking Coupling Alignment Data, Data Interpretation, and Diagramming
Calculating Corrections, Making the Move, Calculating Bearing Shim Changes

Day Three

Shaft Alignment Workshop - Hands-On Shaft Alignment Problems

Considerations w/r Distortion

Special Alignment Cases: Sling Checks, Bearing Reaction Checks

Course Conclusion

COURSE DATES/LOCATION/FEE

For current dates / locations / prices, please see HPC's website, www.hpcnet.com.

WHAT YOU WILL RECEIVE:

1. 1 copy of HPC Technical Services' textbook, Turbine Generator Alignment Workshop.
2. A "Certificate of Completion" with 1.9 CEUs, authorized for issue by the International Associate of Continuing Education/Training.

STEAM TURBINE MAINTENANCE CERTIFICATION:

There are two levels of certification that requires this course for continuation:

1. Field Engineer
2. Mechanical Maintenance Certificate

Those who attend this course are automatically qualified to take HPC Technical Services' Certification Examination. This examination is offered at no additional expense to the participant. An 80% passing grade is required. The examination length will not exceed 2-hours. Those who complete this examination will receive a revised "certificate of completion" that recognizes this accomplishment along with two-copies of a "To Whom It May Concern" letter that states their accomplishment. (Two copies are provided, one for the participants' employer and one for the participants' personal file.)

Consult HPC's website, www.hpcnet.com, for detail on this certification program.

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INSTRUCTOR (S):



Ray Militello Mr. Militello has 39 years of experience in the Utility Industry covering many facets of turbine repairs and overall power plant maintenance activities. Everything that can be done with regard to hands on maintenance or repairs to a steam turbine, he has physically done himself at some point in his career. Ray worked for 10-years with GE as a Turbine Specialist and Field Service Representative. He worked for 16 years with Southern California Edison as a Turbine Specialist, a Service Shop Foreman/Planner, Power Plant Maintenance Department Supervisor and Condition Based Maintenance Specialist. Most recently, Ray worked for Elliott Turbine Machinery as a Shop Manager. With HPC Technical Services, Ray has instructed many mechanical maintenance courses and authored technical documentation. Ray resides in Bradenton FL.



Eldon Bearden Mr. Bearden has 21 years experience in the power generation industry, 10 of them with GE. He started his career as a GE field engineer providing technical services for installations and maintenance (1976-1981 and 2000-2004). Here he was responsible for the installation and startup of a number of large steam turbine-generators and frame 7 gas turbines as well.

In addition to the installation work, he also performed maintenance service on a variety of fossil, nuclear and combined cycle sites. Recently Mr. Bearden accepted a position with HPC as an instructor to teach steam turbine and gas turbine courses. He will also provide site engineering support on HPC contracts during the outage season.



Douglas Lemmo, PE. Mr. Lemmo has 35 years experience in the power generation industry, 31 of them with GE. Within GE he was initially employed as a field engineer (1971-1976). Here he was responsible for the installation and startup of a number of large and medium steam turbine generators and the feed pump turbines. In addition to this installation work, Mr. Lemmo also performed maintenance service on a variety of nuclear, fossil and marine turbine units. After leaving the field, Mr. Lemmo taught in GE's Field Engineering Development Center. Here his specialty was steam turbine generators, installation, alignment and maintenance. After a couple years instructing, he accepted a position selling maintenance and repair services. In 1982, Mr. Lemmo was the Project Manager for a Waste-to-Energy site. Later projects included a modernization of a hydroelectric facility and the management of the installation of a few combined cycle sites. In 2002, Doug left GE and founded Power Generation Consulting Services, which focuses primarily on the operation, maintenance and repair of steam turbine generators. In this last position, Doug has been closely aligned with HPC as he has instructed many of our courses and provided site-engineering support on HPC contracts.

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Art Hinch, P.E. Mr. Hinch has worked in the Power Generation industry for 30+ years. During the 1974-1980 period, Mr. Hinch was employed by GE and was responsible for the installation of multiple large steam turbine generators (fossil and nuclear) and for multiple steam and gas turbine generator outages. To 1992 Mr. Hinch worked as an independent consultant in the south and southwestern regions. During this time frame he worked many turbine-generator outages on GE, Westinghouse, and Siemens units. In addition he worked the start up of a 1300-MW turbine generator unit. In 1992 Art signed on with Arkansas Nuclear One as a senior engineer in the turbine group where he worked primarily in the planning and implementing of turbine generator outages (GE and Westinghouse units). In 2003, Art accepted an early retirement package and has again functioned as an independent engineer, an associate of HPC Technical Services. In this capacity Art has worked multiple steam turbine generator outages on a variety of manufacturers as well as being primary instructor on a number of courses that HPC offers.

Robert Doughty Mr. Doughty has more than 30 years of experience in start up, maintenance and operation of both large and small turbine-generators. Bob started his career as a power plant instrumentation technician while he completed his BS degree in Engineering Technology (1976) at the University of Houston. He has worked as a start up and field engineer for one of the major turbine-generator OEM's and as a consulting engineer, supporting the initial operation of two nuclear fueled power plants. He also was the field-engineering supervisor with overall responsibility for construction testing, initial start up and operations of a 600 MW coal fired generating plant. Later, as an employee of one of the larger independent turbine-generator service corporations, he worked as a start up and maintenance engineer on turbine-generators of all sizes from nearly all the major manufacturers. His most recent position (1999) as the President of Turbine Services, Inc., has allowed him to continue to provide on site technical direction, start up and controls adjustments for several major turbine inspections in the range of 35 to 835 MW. He is experienced in electro-hydraulic and mechanical governor control systems and turbine valve and control system up-grades. Bob is a member of ASME (18 years) and has worked closely with HPC on multiple projects, training as well as field service.

HPC TECHNICAL SERVICES
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REGISTRATION FORM

Company: _____
Plant: _____
Address: _____
City/State/Zip: _____
Telephone: _____ FAX: _____
Course Number/Title: _____
Course Dates: ____/____/____ Thru ____/____/____
Course Location: _____ Course Fee: _____

Please enroll the following individual(s) listed below:

Student #1: _____
Student #2: _____

Taking advantage of HPC's 3-4-2 Policy: Send 3, Pay for 2 when paying in advance.

Student #3: _____

Enrolled by: _____ **Date:** _____

METHOD OF PAYMENT

Check to Follow: _____
 Check Enclosed #: _____
 MC/Visa/AMEX #: _____
Expiration Date: _____ CV Code: _____
 Purchase Order #: _____

HOW DID YOU LEARN OF THIS COURSE?

Attended HPC courses before
 Received a fax
 Received an email
 Internet search
 Received a mailing
 Other: _____