

ASSEMBLY & INSTALLATION (ECS1) - HEAVY INDUSTRY

OVERVIEW

Hands-on course designed to develop and strengthen the mechanical skills required to achieve world-class Precision Maintenance®. While most craft technicians have foundational abilities, precision principles are often untaught, forgotten, or inconsistently applied. This course addresses that gap by teaching reliable, repeatable methods that improve equipment performance, reduce failures, and increase manufacturing profitability.



Why This Training Matters

- ✓ Reducing failures at their source
- ✓ Increasing asset life & production throughput
- ✓ Lowering maintenance cost per horsepower
- ✓ Empowering the craft workforce by driving a culture of precision

Who Should Attend?

- ✓ Maintenance Craft Personnel (mechanics, millwrights, technicians)
- ✓ Operations & Production Personnel
- ✓ Engineers responsible for asset reliability
- ✓ Front-line Supervision & Maintenance Leaders

Subject

- 1. Introduction to Precision**
Maintenance philosophies, cost drivers, failure sources.
- 2. Vibration & Dynamic Measurement Tools**
Failure indicators, vibration and IR tools.
- 3. Fitting of Housings & Shafts**
Precision measurement, correct fits.
- 4. Assembly Errors & Corrections**
Keys, couplings, torque, heating, retention.
- 5. Practical Lubrication**
Grease selection, intervals, failure prevention.
- 6. Precision Shaft Alignment**
Pre-checks, soft foot, pipe strain correction.
- 7. Bearing Types & Failure Analysis**
Failure modes, L10 life, bearing identification.
- 8. Unbalance & Balance Retention**
Static and dynamic unbalance, hands-on balancing.
- 9. Precision Belt Drive Installation**
Alignment, tension, load reduction.

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TYPICAL DAILY OUTLINE

DAY 1

Foundations Of Precision & Initial Measurements

- > Introductions & course overview
- > Maintenance philosophies & vibration tools
- > "As-found" demonstrator hands-on exercise
- > Operating context & maint. requirements
- > Rough alignment and pre-alignment practice
- > Precision measurement labs & report-outs

DAY 3

Precision Shaft Alignment

- > Alignment checklist & angular soft foot
- > Shaft plotting (exercises 1-2)
- > Vertical/horizontal alignment plotting (exercises 3-5)
- > Introduction to "Optimum Move"
- > Begin precise alignment hands-on work

DAY 5

Bearings, Lubrication, Couplings & Final Application

- > Belt-drive practical exercises
- > Bearing types, failure modes, and applications
- > Lubrication viscosity & calculations
- > Coupling requirements & common pitfalls
- > Final review, report-out & graduation

DAY 2

Fits, Tolerances, and Assembly Error Correction

- > Fits & tolerances
- > Bearing fit measurement lab
- > Soft foot & shim consolidation exercises
- > Keys, set screws, pulled threads, torque issues
- > Assembly error correction labs

DAY 4

Thermal Growth, Balance, and Belt Systems

- > Continue precision alignment exercises
- > Thermal growth calculations
- > Intro to balance principles
- > Dynamic balance hands-on
- > Belt drive systems and manufacturer guidance



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LEARNING OBJECTIVES & EXPECTED POST-TRAINING CAPABILITIES

Upon successful completion, participants will be capable of:

Precision Measurement & Installation

- Determining proper bearing and shaft fits
- Using micrometers, dial indicators, gauges, torque wrenches, calipers, and alignment systems
- Documenting all installation results for “as found/as left” validation

Dynamic Condition Assessment

- Using vibration meters, stroboscopes, and infrared tools to verify machine health
- Applying dynamic measurements to improve reliability

Correcting Assembly & Alignment Errors

- Fixing soft foot, pipe strain, bolt-bound and base distortion problems
- Completing precise cold alignment and calculating thermal growth
- Plotting alignment conditions and determining the “best move”

Improving Balance & Belt Drive Performance

- Understanding and correcting static/couple/dynamic unbalance
- Achieving proper belt tension, alignment, and sheave setup

Lubrication & Bearing Reliability

- Calculating correct grease amounts and intervals
- Identifying bearing types and common failure mechanisms
- Preserving evidence for root-cause analysis

Participants are expected to:

- ✓ Perform all hands-on alignment, measurement, lubrication, and assembly exercises
- ✓ Complete daily report-outs documenting findings and corrections
- ✓ Demonstrate competency with vibration tools, alignment plotting, and precision measurements
- ✓ Apply newly learned precision techniques immediately back in their facility