



STARK STATE COLLEGE

GENERAL SYLLABUS

Course Information

Course Name: Compressor Final Inspection
Course Number: ARL231

Required Materials

Textbook(s): Compressor Final Inspection Handbook Ariel Corp.
Required Readings: None
Additional Materials: Scientific Calculator, Laptops, Note Pads, Writing Utensils, Web Links, Handouts and related items as provided in class.

Course Outline/Calendar

The date of coverage and order of coverage may be modified based on the faculty member and events beyond the control of faculty members that interfere with class times and teaching.

Week	Chapter/Topic/Lab
1: Compressor Theory and Types	<ul style="list-style-type: none"> • Introduction to large compressors: Overview of different types (centrifugal, reciprocating, screw), their applications, and their critical role in industrial processes. • Thermodynamics of compression: The fundamental gas laws and thermodynamic principles relevant to compressor operation. • Basic compressor components: Identification and function of major components, including impellers, rotors, cylinders, and valves. • Final inspection purpose: The critical role of final inspection in ensuring quality, safety, and operational reliability.
2: Safety Procedures and Regulations	<ul style="list-style-type: none"> • Compressed air safety: A review of common hazards, including high-pressure injection, noise, and flying debris. • Personal Protective Equipment (PPE): Proper selection and use of safety goggles, hearing protection, and gloves. • Lockout/Tag-out (LOTO): De-energizing equipment and following proper LOTO procedures for inspection. • OSHA and industry standards: An overview of relevant safety and inspection regulations from organizations like OSHA and CAGI.
3: Documentation and Record-Keeping	<ul style="list-style-type: none"> • Manufacturer specifications: How to read and interpret service manuals, technical drawings, and part diagrams. • Inspection checklists: Developing and using detailed checklists for consistent and thorough inspections. • Record-keeping: Maintaining accurate and detailed logs of inspections, tests, and repairs.

Week	Chapter/Topic/Lab
	<ul style="list-style-type: none"> Report generation: Creating comprehensive inspection reports for quality assurance and warranty purposes.
4: Visual and Non-Destructive Testing (NDT) Fundamentals	<ul style="list-style-type: none"> Exterior inspection: Performing a visual check for physical damage, corrosion, and leaks. Fastener inspection: Checking the tightness and condition of all fasteners, bolts, and connection points. Non-destructive testing (NDT) basics: An introduction to common NDT methods relevant to compressors, such as visual testing and dye penetrant testing. Hands-on: Visual inspection: Lab exercise using a decommissioned compressor to perform a detailed visual inspection.
5. Lubrication Systems	<ul style="list-style-type: none"> Oil and filter inspection: Checking oil levels, analyzing oil quality, and inspecting oil filters for contamination. Oil contamination: Identifying signs of contamination (e.g., metal flakes, water) and understanding their impact. Seals and gaskets: Inspecting seals, gaskets, and O-rings for leaks or signs of wear. Hands-on: Lubrication system check: Lab exercise to perform a complete lube system inspection.
6: Cooling Systems	<ul style="list-style-type: none"> Heat exchanger inspection: Checking intercoolers and aftercoolers for cleanliness and signs of clogging. Cooling fan and vents: Inspecting cooling fans and air intake vents for obstructions. Cooling water systems: Checking cooling water lines and regulating valves (if applicable). Hands-on: Cooling system check: Lab exercise to inspect and document the condition of a compressor's cooling system.
7: Drive Components and Alignment	<ul style="list-style-type: none"> Drive belt inspection: Checking the tension and condition of belts for wear or damage. Coupling and alignment: Inspecting shaft couplings and performing basic alignment checks. Vibration analysis: An introduction to vibration measurement and its role in identifying potential issues. Hands-on: Alignment check: Lab exercise to check the alignment of a compressor's drive coupling.
8: Air and Gas Path Components	<ul style="list-style-type: none"> Air intake filters: Checking and cleaning air intake filters and pre-filters. Valves: Inspecting all valves (e.g., safety relief, check, unloader) for proper operation and leakage. Piping and hoses: Checking all interconnecting piping, hoses, and fittings for leaks or cracks. Hands-on: Valve and piping check: Lab exercise to systematically inspect all valves and air lines.
9: Electrical Components	<ul style="list-style-type: none"> Power supply and wiring: Checking for loose, damaged, or frayed wiring and proper grounding. Motor inspection: Visually inspecting the compressor motor and bearings. Control panels: Checking control panels, switches, and circuit breakers for damage or proper function. Hands-on: Electrical system check: Lab exercise on a powered-down unit to inspect electrical connections and controls.
10: Instrumentation and Sensors	<ul style="list-style-type: none"> Pressure gauges and sensors: Calibrating and verifying the accuracy of pressure gauges and other sensors. Temperature sensors: Inspecting and verifying the function of temperature sensors and probes. Alarm and trip systems: Testing the functionality of alarms and automatic shut-off systems. Hands-on: Instrumentation testing: Lab exercise using a test stand to verify sensor and alarm functionality.
11: Control Logic and System Testing	<ul style="list-style-type: none"> Control module review: Understanding and verifying the compressor's control module and its logic. Auto-drain systems: Checking automatic condensate drains for proper operation. System simulations: Using software or simulations to test the control system under various conditions. Hands-on: Control system review: Lab exercise to review and test the compressor's control system.
12: Post-Repair Inspection and Commissioning	<ul style="list-style-type: none"> Post-repair checklist: Specific procedures for inspecting a compressor after major maintenance or repair work. Initial run-up: The process for safely starting a newly assembled or repaired compressor. Commissioning process: Understanding the full commissioning protocol before placing a compressor into service.

Week	Chapter/Topic/Lab
	<ul style="list-style-type: none"> • Hands-on: Post-repair inspection: Lab exercise performing an inspection on a staged compressor that has undergone a simulated repair.
13: Performance Testing	<ul style="list-style-type: none"> • Performance standards: An overview of industry standards for compressor performance testing (e.g., ASME PTC). • Test data collection: Using instrumentation to gather performance data such as pressure, flow, and temperature. • Performance curve analysis: Interpreting compressor performance curves to detect off-design operation. • Hands-on: Performance testing: Lab exercise to perform a simplified performance test and analyze the data.
14: Troubleshooting and Failure Analysis	<ul style="list-style-type: none"> • Root cause analysis: Techniques for identifying the underlying cause of a compressor failure. • Common compressor faults: Diagnosing issues such as air leaks, overheating, and short-cycling. • Abnormal operating conditions (AOCs): Recognizing signs of trouble during inspection. • Hands-on: Case studies: Lab sessions to troubleshoot and diagnose simulated compressor failures.
15: Final Exam and Practical Skills Evaluation	<ul style="list-style-type: none"> • Written examination: A comprehensive test covering all aspects of compressor theory, safety, and inspection procedures. • Practical examination: A hands-on evaluation where students perform a complete final inspection on a designated compressor, documenting all findings. • Report submission: Submission of the formal inspection report from the practical exam.
16: Review, Advanced Topics, and Certification	<ul style="list-style-type: none"> • Exam review: Discussing and reviewing the final exam and practical evaluation results.