INDUSTRIAL MAINTENANCE TECHNOLOGY

The **Industrial Maintenance Technician** program prepares students with the education and experience necessary to begin employment within the Potash mining industry. Students receive training on state-of-the-art equipment which simulates the actual work performed both above and below ground in the potash mines. Additional exposure to the industry is provided through field experiences. Specializations offered within the curriculum include electrical and mechanical options.

Graduation Requirements

Certificate in Industrial Maintenance Technician: A cumulative GPA of 2.0 or higher. A minimum of 9 credits earned toward the certificate must be completed at SENMC.

AAS in Industrial Maintenance Technician: ENGL 1110G Composition I with a C- or higher; placement into college-level math and reading courses or completion of developmental courses with a C- or higher; cumulative GPA of 2.0 or higher. A minimum of 15 of the 60 credits for the associate's degree must be completed at SENMC.

- Industrial Maintenance Technician Electrical - Associate of Applied Science (https://senmc-public.courseleaf.com/academic-programs/associate-degree-certificate-programs/industrial-maintenance-technology/industrial-maintenance-technician-electrical-aas/)
- Industrial Maintenance Technician Mechanical - Associate of Applied Science (https://senmc-public.courseleaf.com/academic-programs/associate-degree-certificate-programs/industrial-maintenance-technology/industrial-maintenance-technician-mechanical-aas/)
- Industrial Maintenance Technology Electrical - Certificate (https://senmc-public.courseleaf.com/academic-programs/associate-degree-certificate-programs/industrial-maintenance-technology/industrial-maintenance-technology-electrical-certificate/)
- Industrial Maintenance Technology Mechanical - Certificate (https://senmc-public.courseleaf.com/academic-programs/associate-degree-certificate-programs/industrial-maintenance-technology/industrial-maintenance-technology-mechanical-certificate/)

INMT 133 Process Technology and Systems 4 Credits (4)
Provides instruction in the use of common process equipment. Students will use appropriate terminology and identify process equipment components such as piping and tubing, valves, pumps, compressors, turbines, motors, engines, heat exchangers, heaters, furnaces, boilers, filters dryers and other miscellaneous vessels. Included are the basic functions, scientific principles and symbols. Students will identify components on typical Process Flow Diagrams and Process and Instrument Diagrams.

Learning Outcomes

1. Explain the different pieces of equipment used in moving fluids through a process plant such as piping, valves, pumps, compressors, motors, engines, turbines, and power transmission devices. Explain the purpose of each component. Understand the applications for the different types of equipment in each classification and their operating principles.
2. Explain the different types of heat exchangers and cooling towers used in the Process Industry as well as their components. Describe their operating principles and the operator's role in their operation.
3. Explain the different types of boilers and furnaces as well as their components. Describe their operating principles and the operator's role in their operation.
4. Explain the function of filters and dryers along with their principles of operation and the operator's role in their operation.
5. Explain the different types of vessels used in the process industry and well as their components and auxiliary systems. Define what happens internally in the different vessels.
6. Demonstrate reading Process Flow Diagrams and Piping and Instrumentation Diagrams.
7. Apply terms used when describing the various pieces of equipment

View Course Outcomes

INMT 134 Maintenance Principles 4 Credits (4)
The course is an introduction to the maintenance of equipment utilizing mechanical, electrical and instrumentation concepts. Topics include: hand tools, bearing fundamentals, equipment lubrication, material handling, electrical safety, battery systems, diagrams, electrical production and distribution, transformers, breakers, switches, AC and DC motors, motor controllers and operations, and introduction to automation and instrumentation control.

Learning Outcomes

1. Describe applications of preventive and corrective maintenance on automated industrial production machines.
2. Explain troubleshooting procedures using systems block.
3. Define the various types of electromechanical systems and equipment and how they operate.

View Course Outcomes

INMT 165 Equipment Processes 4 Credits (4)
This course introduces power transmission equipment and machinery components, including belt/chain driven equipment, speed reducers, variable speed drives, couplings, clutches, and conveying equipment. Students will learn the operation, maintenance, and troubleshooting for these types of equipment. The course also includes Overhead Crane Certification and Safety.

Learning Outcomes

1. Explain how Thermal Process System works.
2. Identify parts of Thermal System and Steam machines.
3. Identify troubleshooting of thermal machine.
4. Explain the steps of how to operate the Thermal Systems.

View Course Outcomes

INMT 205 Programmable Logic Controllers and Applications 4 Credits (4)
Students learn about programmable logic controllers; architecture; programming, interfacing, and applications. Hands-on experience on modern commercial PLC units is the main component.

Prerequisite(s): BCIS 1110

Learning Outcomes

1. Explain the basics of PLCs.
2. Describe how PLCs are used in industrial environments.
3. Demonstrate ability to program a PLC unit to solve a problem.

View Course Outcomes

INMT 223 Electrical Repairs 4 Credits (4)
This course outlines for students the types of problems that occur in electrical machinery and systems. The course covers trouble-shooting and diagnosis, preventative maintenance, and how to make necessary repairs.

Learning Outcomes

1. Demonstrate how to make an electrical repair.
2. Explain how to diagnose a typical electrical occurrence in need of repair.
3. Describe some of the most common breakdowns in electrical equipment.

View Course Outcomes

INMT 235 Mechanical Drives I 4 Credits (4)
This course teaches the fundamentals of mechanical transmission systems used in industrial, agricultural, and mobile applications. Students will learn industrial relevant skills including how to: operate, install and analyze performance, and design basic transmission systems using chains, feed-belts, spur gears, bearings, and couplings. Vibration analysis will be used to determine when to perform maintenance of power transmission components. The course also covers power transmission safety, and introduction to belt and chain drives (applications, installations, and tensioning), and introduction to gear drives, coupling, and bearing, basic troubleshooting, blueprint and print reading, learning the basics of electrical drives and PDM and PM.

Learning Outcomes

1. Demonstrate a lockout/tagout, use a spirit level to determine orientation of a surface, mount an electric motor and correct for a soft foot condition, level an electric motor and use a digital tachometer to measure motor speed on the equipment correctly.
2. Explain the selection of a key size for a given application, measure a key and key seat, cut and file key stock to fit a key seat. Assemble a hub to a shaft using a key seat. Use a pony brake system to measure shaft torque, calculate rotary mechanical power and efficiency. Measure electric motor current.
3. Define how to identify shaft size, install and adjust pillow block antifriction bearings and shaft. Install a flexible jaw coupling. Align two shafts using a straight edge and feeler gauge.
4. Calculate pulley ratio, shaft speed and torque of a chain drive system, install and align a fractional HP V-belt with a finished bore, determine the belt deflection force, and adjust belt tension.

View Course Outcomes

INMT 237 Hydraulics I 2 Credits (2)
This course teaches fundamentals of hydraulic systems used in industry mobile application. Students learn the basic theory of application of hydraulic and electricity as it applies to hydraulics. Covered in the course are basic systems, principles of flow, pressure, viscosity, filtration, and colling. Also covered are basic components such as motor, pumps, cylinders, piping and control and relief valves. Troubleshooting strategies are discussed, along with blueprint and print reading, and PDM and PM. Industry, relevant skills including how to operate, install, analyze performance, and design basic hydraulic systems, reviewing intermediate hydraulic components and system applications.

Learning Outcomes

1. Demonstrate how to apply pressure and force fluid characteristics, power and work, Pascal's law.
2. Define the hydraulic learning system. They will have to determine which components to install and operate correctly. The students will use schematic drawings to interpret how to set up various hydraulic circuit applications. The student will analyze the various components in operation.
3. Explain operational scenarios that recreate a variety of real world scenarios. There are directional control valves, check valves and relief valves which must be installed correctly for the system to run according to the various objectives.

View Course Outcomes

INMT 261 Pump Operations I 4 Credits (4)
This course teaches how to select, operate, install, maintain and repair the many types of pumps used by industry. Students learn the theory and practical application of all types of processed pumps and pipe systems. It covers types, components, and systems operation. It also covers troubleshooting for flow loss and cavitation. Students learn how to select, operate, install, maintain and repair the many types of pumps used by industry. Other topics covered include: Net Positive Suction Head, pump flow/head measurement, pressure head conversion, pressure flow characteristics, cavitation, series/parallel pump operation, mechanical seal/stuffing box maintenance, multi stage operation and construction, positive displacement pumps, turbine, diaphragm, peristaltic, piston, gear, and magnetic pump systems.

Learning Outcomes

1. Explain how to operate, install, maintain and repair the many types of centrifugal pumps used today by industry. Explain how the various pumps work and how to troubleshoot and maintain them. The student will learn parallel and series pump operation and performance.
2. Describe how various charts and tables determine flow rates for the various pump applications. The student will compare, contrast, prepare flow and pressure charts. They will compare and contrast the pumps and discuss them with their work partner.
3. The student will demonstrate the use of each pump under a variety of conditions such as a variable speed pump motor drive, load valve, air ingestion valve, and cavitation valve. The student will determine the correct type of pump for a specific application.

View Course Outcomes

INMT 262 Piping Systems 2 Credits (2)
This course teaches students how to install, maintain and troubleshoot fluid systems such as how to select, size, identify, install a variety of types of piping, fittings, and valves. Measurement techniques from basic to precision measurement, gauging, including the fundamentals of dimensioning and tolerancing will taught.

Learning Outcomes

1. Demonstrate how to install fluid systems as well as troubleshoot and maintain them. The student will learn basic measurement, gauging, tolerance, and data acquisition. The students will show how to use a drill press, band saw, various hand and power tools.
2. Explain how to prepare a plan and build according to specifications. The students will compare data and the various methods of measurement. With a blending of the various activities, this will allow the student to explain how they are going to design and install various pieces of equipment.
3. The student will be presented with installation problems that recreate a variety of real world scenarios. The hands on activities of the many structured task enables the student to use these performances in other portions of the program.
4. Show how some math is integrated into this program.

View Course Outcomes

INMT 263 Mechanical Drives II 4 Credits (4)
This course teaches the bearings and gears used in heavy duty mechanical transmission systems. This course will emphasize linear access drives, clutches, and brakes. In addition, this course teaches how to set up, operate and apply laser shaft alignment to a variety of industrial applications. This course is a study of the basic concepts and procedures for the maintenance and operations of pumps, turbines, seals, bearings, and compressors. The course will provide the student with the knowledge and skills necessary to perform proper maintenance, repair, replacement and selection of pumps, turbines, seals, bearings and compressors. Also covered are advanced gearbox, coupling and bearings, precision alignment (shaft, flange, and sheave), as well as basic vibration analysis and thermography as troubleshooting and RCA aids.

Learning Outcomes

1. Explain how to troubleshoot positive displacement pumps, non-positive displacement pumps, single and multistage turbines, reciprocating and centrifugal compressors, and shaft seals.
2. Remove positive displacement pumps, non-positive displacement pumps, single and multistage turbines, reciprocating and centrifugal compressors, and shaft seals.
3. Repair (including identifying proper replacement parts) positive displacement pumps, non-positive displacement pumps, single and multistage turbines, reciprocation and centrifugal compressors, and shaft seals.
4. Install positive displacement pumps, non-positive displacement pumps, single and multistage turbines, reciprocating and centrifugal compressors, and shaft seals.
5. Perform basic shaft alignments for horizontally-mounted equipment

View Course Outcomes

INMT 264 Rigging 2 Credits (2)
This course teaches how to safely move loads of different shapes and sizes using a variety of different methods. Students will lift loads and demonstrate how to move it. Students will use hoists, slings, ropes and fittings to learn how to safely lift a wide variety of loads. Included are weight estimation, lifting rules, load ratings (sling, wire, ropes and hoists).

Learning Outcomes

1. Calculate load weight given with per unit length. Calculate the volume of a complex object. Calculate load weight given specific weight and dimension. Calculate the center of gravity of a load. Balance load. Identify hook type given a sample. Identify eyebolt type given a sample. Install an eyebolt for lifting.
2. Show how to mouse a hook. Use a block and tackle to lift a load. Use an endless chain hoist to lift a load. Use a lever-operated hoist to lift a load. Use an electric hoist to lift a load. Select a hoist; inspect lifting hook, eyebolt, and hoist.
3. Calculate sling force of a sling given sling type and loss factor. Calculate sling force of a sling given sling type and sling angle. Assemble and lift a load using a double basket sling. Assemble and lift a load using a choker sling. Assemble and lift a load using a bridle sling. Assemble and lift a load using a U-sling. Calculate crush force. Calculate sling efficiency

View Course Outcomes

INMT 265 Hydraulics II 2 Credits (2)
This course teaches advanced hydraulics systems. The student will learn operation of advanced hydraulic systems applications, equipment installation, performance analysis of motors and pumps, accumulators, control, relief and check valve, equipment maintenance, and system design. The course covers accumulators, sequence valves, pilot circuits and unloader valves. Students learn more troubleshooting, hydraulic drives and other applications.

Learning Outcomes

1. Connect a pilot-operated relief valve to unload a pump by venting. Connect and operate a remotely controlled pilot –operated relief valve circuit. Design a circuit to provide a two-pressure control with unloading.
2. Connect and operate a P-port check valve circuit. Connect and operate a pilot-operated check valve. Connect and operate a load-lock circuit. Measure pilot-operated check valve pilot pressure. Calculate the pilot pressure required to open a POC valve. Calculate the maximum pressure in a POC valve circuit. Design a POC valve circuit.
3. Pre-charge an accumulator. Determine accumulator pre-charge pressure. Connect and operate an accumulator bleed-down circuit. Connect and operate an accumulator to safely provide auxiliary and/or emergency power. Design an accumulator circuit to compensate for leakage. Size a bladder-type accumulator.
4. Select a hydraulic motor type for a given application. Identify the correct application for a hydraulic motor. Measure hydraulic motor speed using a strobe-light tachometer. Connect and operate a parallel motor synchronization circuit. Connect and operate a series motor circuit. Connect and operate a free-wheeling motor circuit. Connect and operate a unidirectional motor breaking circuit using a relief valve. Connect and operate a motor circuit with cross cushion relief valve breaking.
5. Calculate the theoretical pump flow rate given displacement. Calculate actual pump flow rate given volumetric efficiency. Calculate hydraulic power. Size a prime mover given pump overall efficiency. Determine overall efficiency given a pump efficiency curve. Calculate the theoretical speed of a motor given its displacement and flow rate. Calculate actual hydraulic motor speed given volumetric efficiency. Calculate theoretical hydraulic motor torque given displacement. Calculate the theoretical hydraulic motor torque given torque specification. Calculate actual motor torque given mechanical efficiency. Determine actual motor torque using a torque-speed curve.
6. Size a conductor. Measure the viscosity of a fluid. Inspect the seals of a sub plated directional control valve. Change a filter element. Size and select a reservoir. Size a heat exchanger.

View Course Outcomes

INMT 267 Pump Operations II 2 Credits (2)
This course teaches the student the disassembly, inspection and reassembly of centrifugal and positive displacement pumps. This course allows the student to identify and replace worn or broken components of pumps, and learn predictive and preventive maintenance principles. Lockout of the pump will be performed in addition to measurements and alignment.

Learning Outcomes

1. Demonstrate the reassembly of a centrifugal pump.
2. Define casing wearing, ring clearance and shaft inspection.
3. Explain the disassembly, cleaning, and inspection process.

View Course Outcomes