

GRANDE PRAIRIE REGIONAL COLLEGE
Industrial Training

Power Engineering Program

COURSE SYLLABUS - SEMESTER II

GAS PROCESSING LEVEL II: PN 1450

This course is designed to assist engineering students to understand the physical, chemical and engineering principles used in the handling of natural gas and its associated liquids and other compounds obtained from natural gas. How it is treated from its underground origin, through the treating processes to the production of pipeline sales gas.

Prerequisites: PN 1405

Textbooks: *Natural Gas Processing* Book A

Class Hours: See Timetable

Class: Reference Material Source and Lecture Time



Course Objectives

Unit 1: Glossary of Terms

Unit 2: Occurrence of Petroleum Deposits

Upon the successful completion of this unit, the student will be able to:

1. describe the history of natural gas development in Alberta.
2. describe the exploration, drilling, and discovery division of the natural gas industry.
3. describe the development and production division of the natural gas industry.

4. describe the processing, transmitting, storing, and marketing division of the natural gas industry.

Unit 3: Exploration of Petroleum Deposits

Upon the successful completion of this unit, the student will be able to:

1. describe the different methods and equipment used in surface geological surveying.
2. describe the geophysical methods used to geologically evaluate the subsurface rock prior to the drilling of the well.
3. describe the geophysical methods and equipment used to geologically evaluate the rock in the borehole after drilling of the well.

Unit 4: Land Survey Systems

Upon the successful completion of this unit, the student will be able to:

1. describe each of the types of land survey systems.
2. describe the unique identifier method for each survey system.
3. reference well locations, leases, and surface facility locations under each of the survey systems.
4. describe special allowances given for roadways and the earth's curvature.

Unit 5: Drilling Methods and Equipment

Upon the successful completion of this unit, the student will be able to:

1. describe the arrangements which must be made prior to moving the drilling equipment on to the lease.
2. describe the tools and components used in rotary and cable tool drilling.
3. describe the functions of the main systems on a gas or oil drilling rig.
4. describe the safety measures to be followed, and discuss the techniques used in properly drilling a well.

Unit 6: Testing, Completion, and Production Methods

Upon the successful completion of this unit, the student will be able to:

1. describe the tests involved in determining the well fluid characteristics, and the procedures followed to establish the production potential of the well.
2. describe the methods used to determine the allowable production of the well.

3. describe any special testing which will be carried out on the well.
4. describe the equipment and discuss the installation procedures followed to prepare the well for production.
5. discuss the initial treatment required to stimulate the production capability of the well.
6. discuss the natural and artificial methods used to ensure maximum continuous production of the well.

Unit 7: Oil and Gas Compositions and Sales Specifications

Upon the successful completion of this unit, the student will be able to:

1. discuss the specific chemical terms and definitions as they apply to oil and natural gases.
2. describe the grouping of hydrocarbon compounds found in natural gases.
3. describe the nonhydrocarbon compounds which contaminate and dilute natural gases.
4. describe the types of oils and natural gases.
5. describe typical sales/delivery specifications for oil and natural gases.

Unit 8: Flow Diagrams Introduction

Upon the successful completion of this unit, the student will be able to:

1. describe the importance of being able to read blueprints.
2. identify the process equipment symbols used in process flow diagrams.
3. identify the piping symbols used in piping and instrumentation diagrams.

Unit 9: Flow Diagrams – Instrument Hookups

Upon the successful completion of this unit, the student will be able to:

1. identify instrumentation symbols on process and mechanical flow diagrams.
2. identify installation drawings of typical pressure, temperature, flow, and level control loops.

Unit 10: Flow Diagrams – Process Flow, Material Balances

Upon the successful completion of this unit, the student will be able to:

1. describe how the material balance provides necessary information for equipment and piping sizing.

2. describe how the material balance is used to verify plant performance.
3. describe how the material balance and process flow diagrams are used to outline the basic plant operational concepts.

Unit 11: Flow Diagrams – Mechanical Flow

Upon the successful completion of this unit, the student will be able to:

1. describe how the mechanical flow diagram is used to prepare construction bids.
2. describe how the mechanical flow diagram is used by construction and inspection personnel to ensure that a plant is properly built.
3. describe how the mechanical flow diagram is used to train personnel.
4. identify the common abbreviations used on mechanical flow diagrams.

Unit 12: Field Operations – Design, Normal Operation

Upon the successful completion of this unit, the student will be able to:

1. discuss the factors which influence the choice of field treating equipment.
2. discuss the safety procedures field operations require.
3. discuss the basic start-up and shutdown procedures used in a gas field.

Unit 13: Field Operations – Production Problems and Prevention

Upon the successful completion of this unit, the student will be able to:

1. describe the various types of corrosion which may attack the well components and the methods used to reduce this attack.
2. discuss mechanical problems which may be encountered and describe how they are prevented or remedied.
3. discuss how hydrates are formed, describe the problems they cause, and detail the methods used to prevent or remove hydrates.

Unit 14: Field Operations – Gas Line Heating

Upon the successful completion of this unit, the student will be able to:

1. Describe the configurations of various indirect fired heaters.
2. Discuss the operational procedures to be followed when placing a line heater into service.

3. Describe the operational and maintenance problems which may be encountered in the operation of these fired heaters.
4. Discuss the variables which are to be considered when selecting a line heater.

Unit 15: Field Operations – Separation Procedures and Equipment

Upon the successful completion of this unit, the student will be able to:

1. describe the complex mixture of compounds produced in a well and discuss the physical makeup of these compounds.
2. discuss the factors and principles involved in the separation of liquids, gases and solids.
3. describe the types and designs of separation equipment utilized.

Unit 16: Field Operations – Conventional Separators

Upon the successful completion of this unit, the student will be able to:

1. describe the internal design requirements and characteristics of a modern separator.
2. describe the four main types of conventional separators.
3. discuss the construction details and operational procedures for each type of conventional separator.

Unit 17: Field Operations – Stage and Low-temperature separation

Upon the successful completion of this unit, the student will be able to:

1. describe the multistage process used to separate hydrocarbons into their liquid and gaseous phases.
2. discuss the theoretical approach versus the practical methods used to maximize staged liquid hydrocarbon recovery.
3. discuss the equipment required to separate hydrocarbons when using the low-temperature separation process.
4. describe the procedures to be followed in the operation of staged and low-temperature separation units.

Unit 18: Field Operations – Selection and Operation of Separators

Upon the successful completion of this unit, the student will be able to:

1. discuss the process variables which dictate the type and size of separator to be purchased.

2. discuss the basic instrumentation required on a typical separator.
3. discuss the maintenance considerations for a typical separator.
4. discuss the operational problems which may be encountered on a typical separator.

Evaluation

Final Exam	35%
Midterm	35%
Quizzes and Assignments.....	30%

Summary of PN1450 Course Hours

Lecture	20 hours
Exam/Quiz.....	<u>4 hours</u>
Total	24 hours