

MODULE ENM3020: CONVENTIONAL OIL/GAS 2 (RECOVERY & PRODUCTION)

Level:	Advanced
Theme:	Technology and Applications
Prerequisite:	ENM2020 Conventional Oil/Gas 1 (Resource Exploration)
Module Description:	Students examine specific recovery and production techniques within the context of a conventional oil and/or gas industry, and they explain related career opportunities.

Module Parameters: Access to conventional oil/gas recovery and production industry.
Access to a science laboratory.

This module requires off-campus learning experiences and should be combined with relevant work study, work experience and/or modules from the Career Transitions strand; consultation with the work-site supervisor will ensure that relevant safety considerations are addressed.

See the *Off-Campus Education Guide for Administrators, Counsellors and Teachers* (Alberta Education) for further information regarding off-campus learning.

Supporting Module: CTR2210 Workplace Safety (Practices) [Career Transitions Strand]; recommended for off-campus learning

Students must have a general knowledge of potential hazards and accepted safety practices relevant to specific recovery and production sites prior to engaging in off-campus learning experiences. See Planning for Instruction in Section C of this Guide for further information regarding student safety.

Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> describe techniques used to complete and service a conventional oil or gas well 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> a presentation or report that describes and illustrates steps taken to prepare a successful oil or gas well for production. Report to address: <ul style="list-style-type: none"> – installation of production casing and tubing – cementing – installation of wellhead – well perforation – well stimulation treatments. <p><i>Assessment Tool</i> <i>Presentations/Reports: Advanced Level, ENMPRE-3</i></p> <p><i>Standard</i> <i>Achieve a minimum rating of 3 on the rating scale for Presentations/Reports</i></p>	40

MODULE ENM3020: CONVENTIONAL OIL/GAS 2 (RECOVERY & PRODUCTION)
(continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • through laboratory and/or field-based investigations: <ul style="list-style-type: none"> – identifying applications of principles of science and technology in well production operations – comparing the principles and processes involved in naturally flowing wells with those depending on recovery by artificial lift. <p><i>Assessment Tool</i> <i>Lab Investigations: Advanced Level, ENMLAB-3</i> <i>Observation Checklist for Field-based Investigations, ENMOBS</i></p> <p><i>Standard</i> <i>Conduct lab investigations to a standard of 3 on the rating scale <u>and/or</u> complete all sections of the observation checklist for field-based investigations</i></p> <ul style="list-style-type: none"> • a summary of environmental assessment and management practices conducted by industry throughout recovery and production operations. <p><i>Assessment Tool</i> <i>Presentations/Reports: Advanced Level, ENMPRE-3</i></p> <p><i>Standard</i> <i>Achieve a minimum rating of 3 on the rating scale for Presentations/Reports</i></p> <ul style="list-style-type: none"> • a concept test in which the student demonstrates knowledge of well-site production equipment and surface facilities, and their function in recovery, production and environmental/workplace safety. <p><i>Assessment Tool</i> <i>Energy Sources/Applications/Alternatives (Instructor's Manual)</i></p> <p><i>Standard</i> <i>Response indicating 60% mastery</i></p>	

MODULE ENM3020: CONVENTIONAL OIL/GAS 2 (RECOVERY & PRODUCTION)
(continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • explain applications of enhanced oil recovery technology in maximizing recovery rates for conventional oil or gas • describe field gathering facilities and distribution systems used in the conventional oil or gas industry • explain career opportunities relevant to the recovery and production sector of the conventional oil and gas industry 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • completing a research project on secondary and tertiary methods of enhanced oil recovery. Research to address: <ul style="list-style-type: none"> – water and gas injection – pumping technology – miscible flooding – steam injection – fireflooding – horizontal drilling. <p><i>Assessment Tool</i> <i>Research Process: Enhanced Oil Recovery, ENM3020–1</i></p> <p><i>Standard</i> <i>Complete all components of research to a standard of 3 on the rating scale</i></p> <ul style="list-style-type: none"> • a flow chart that traces the movement of a conventional oil or gas commodity from well-site to market (or refinery). Flow chart to illustrate (as appropriate): <ul style="list-style-type: none"> – separation facilities – field storage techniques – distribution networks – pipeline systems – pump/compressor stations. <p><i>Assessment Tool</i> <i>Assessment Criteria: Flow Charts, ENMFLO</i></p> <p><i>Standard</i> <i>Complete the flow chart to a standard of 3 on the rating scale</i></p> <ul style="list-style-type: none"> • completing a research project on technical, professional and/or labour-based careers in the recovery and production sector of conventional oil and gas industry. <p><i>Assessment Tool</i> <i>Career Search: Advanced Level, ENMCAR–3</i></p> <p><i>Standard</i> <i>Conduct research to a standard of 3 on the rating scale</i></p>	<p>20</p> <p>20</p> <p>20</p>

MODULE ENM3020: CONVENTIONAL OIL/GAS 2 (RECOVERY & PRODUCTION)
(continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> demonstrate basic competencies. 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> observations of individual effort and interpersonal interaction during the learning process. <p><i>Assessment Tool</i> <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>Integrated throughout</p>

Concept	Specific Learner Expectations	Notes
Well Completion and Servicing	<p><i>The student should:</i></p> <ul style="list-style-type: none"> outline steps that are taken to prepare a successful oil or gas well for production: <ul style="list-style-type: none"> installation of production casing and tubing cementing installation of wellhead well perforation describe well-site production equipment and surface facilities and their function in production, maintenance and safety; e.g.: <ul style="list-style-type: none"> service rig flare line accumulators distinguish between natural flowing wells and wells that depend upon artificial lift explain well stimulation treatments used to ensure underground movement of hydrocarbons to the well bore describe methods used to control well production explain environmental assessment and management practices conducted by industry throughout recovery and production operations 	<p>Discuss safety considerations relevant to the well-site; e.g.:</p> <ul style="list-style-type: none"> first aid clothing and equipment government/industry regulation lifting/hoisting techniques. <p>Identify general parts of a service rig and accompanying equipment; e.g.:</p> <ul style="list-style-type: none"> blowout preventers rig tank tongs wellhead. <p>Encourage students to make links with concepts studied in the core science program.</p> <p>For example,</p> <ul style="list-style-type: none"> acidizing fracturing. <p>Research environmental standards and the enforcement of safe operating procedures throughout recovery and production activities.</p>

MODULE ENM3020: CONVENTIONAL OIL/GAS 2 (RECOVERY & PRODUCTION)
(continued)

Concept	Specific Learner Expectations	Notes
Well Completion and Servicing (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • describe technological advances used to address environmental concerns throughout recovery and production • research well completion practices and production equipment used in frontier operations. 	<p>Gather information regarding practices followed to maintain environmental standards; e.g.:</p> <ul style="list-style-type: none"> • directional wells • land reclamation • control of sulphur emissions. <p>For example:</p> <ul style="list-style-type: none"> • arctic • off-shore.
Enhanced Oil Recovery	<ul style="list-style-type: none"> • identify factors that determine the portion of oil in a reservoir that can be produced naturally through primary recovery methods; e.g.: <ul style="list-style-type: none"> – density and viscosity of the oil – porosity and permeability of the rock – pressure in the reservoir • explain applications of infill drilling to improve oil or gas recovery rates • explain secondary methods of enhanced oil recovery • explain tertiary methods of enhanced oil recovery • identify factors that influence the life of an oil and/or gas well • describe techniques used to estimate recoverable oil and gas reserves • describe future sources of oil and gas supplies; e.g.: <ul style="list-style-type: none"> – unrecovered oil in existing reservoirs – frontier production – oil sands. 	<p>Cite reasons for making production as efficient as possible.</p> <p>Average recovery in light oilfields is about 30% of the original oil. The remaining 70% cannot be recovered economically with existing technology.</p> <p>Research the use of directional wells for infill drilling.</p> <p>For example:</p> <ul style="list-style-type: none"> • water and gas injection • pumping technology. <p>For example:</p> <ul style="list-style-type: none"> • miscible flooding • steam injection • fireflooding • horizontal drilling. <p>Compare and contrast the concepts of “proved reserve,” “probable reserve” and “established reserve.”</p> <p>Discuss factors that determine estimates of recoverability and producibility; e.g.:</p> <ul style="list-style-type: none"> • reservoir characteristics • economic considerations • regulatory limitations.

MODULE ENM3020: CONVENTIONAL OIL/GAS 2 (RECOVERY & PRODUCTION)
(continued)

Concept	Specific Learner Expectations	Notes
Gathering and Distribution	<p><i>The student should:</i></p> <ul style="list-style-type: none"> • describe well-site and satellite facilities used for dehydration, separation, heating and measurement processes • describe different types of field storage facilities • research distribution networks used to move conventional oil or gas from well-site to market (or refinery) • describe the layout of a pipeline system used for transporting conventional oil or gas • explain the function of pump and compressor stations in moving oil or gas along transmission lines. 	<p>For example:</p> <ul style="list-style-type: none"> • surface • underground. <p>For example:</p> <ul style="list-style-type: none"> • pipeline systems • tankers and barges. <p>For example:</p> <ul style="list-style-type: none"> • rail systems • trucking systems. <p>For example:</p> <ul style="list-style-type: none"> • gathering lines • trunk lines • gas transmission systems. <p>Research electronic inspection devices used to detect potential problems such as faulty welds, dents, cracks or corrosion.</p>
Career Opportunities	<ul style="list-style-type: none"> • research careers and the range of occupational opportunities within the recovery and production sector of a mineral industry; e.g.: <ul style="list-style-type: none"> – earth science – engineering – technical and support services – apprenticeship trades – environmental management • evaluate current employment opportunities based on employment statistics • research recovery and production trends and future career opportunities. 	<p>Plan for individual/group research and presentations that address:</p> <ul style="list-style-type: none"> • job description • employment market • education/training • wage expectations. <p>Contact the “Career Information Hotline” (Alberta Advanced Education and Career Development).</p> <p>See the National Occupational Profiles (NOC) in Section H: Linkages/Transitions.</p> <p>Arrange/facilitate:</p> <ul style="list-style-type: none"> • information interviews • work study/experience • job shadowing.