Advanced Towers and Vessels
Annotated Instructor's Guide

Module 32501-09

MODULE OVERVIEW

This module covers the function and operation of vessels and towers, especially those used in refineries. Information is provided about safety issues associated with the refinery process. The use of hydraulic torquing and tensioning equipment is also covered.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Industrial Maintenance Mechanic Level One; Industrial Maintenance Mechanic Level Two; Industrial Maintenance Mechanic Level Three;* and *Industrial Maintenance Mechanic Level Four.*

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. Describe basic reactor mechanics and functions, including vacuum distillation towers and stripper towers.
2. Demonstrate hydraulic torquing and tensioning.

PERFORMANCE TASK

Under the supervision of the instructor, the trainee should be able to do the following:

1. Using equipment provided by your instructor, demonstrate hydraulic torquing and tensioning.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Pictures of various types of towers and vessels
Pictures of refinery fires or explosions
Hydraulic torquing and tensioning equipment
Examples of manual ratcheting wrenches
Appropriate nuts, bolts, and tensioning discs
Hydraulic hose connectors
Copies of the Quick Quizzes*
Module Examinations**
Performance Profile Sheets**

*Located at the back of this module.

**Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Trainees will be required to perform hydraulic torquing and tensioning. Ensure that they are properly briefed on the safe use of hydraulic torquing and tensioning tools and are familiar with all appropriate safety precautions and procedures.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

OSHA Technical Manual, Section IV, Chapter 2, *Petroleum Refining Processes*. Available at: http://www.OSHA.gov/dts/osta/otm/otm_iv/otm_iv_2.html.

American Petroleum Institute at: www.api.org.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 15 hours are suggested to cover *Advanced Towers and Vessels*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	**Planned Time**
Sessions I-II. Introduction; Separation Processes	
A. Introduction	_____
B. Separation Processes	_____
1. Desalting	_____
2. Atmospheric Distillation	_____
3. Vacuum Distillation	_____
4. Distillation Tower Hazards	_____
Sessions III-IV. Conversion and Other Refining Processes	
A. Conversion Processes	_____
1. Solvent Extraction and Dewaxing	_____
2. Cracking Processes and Hazards	_____
B. Treatment, Formulating, and Blending Processes	_____
C. Other Refining Processes	_____
1. Heating and Cooling	_____
2. Steam	_____
3. Recovery	_____
4. Discharge Management	_____
Session V. Hydraulic Torquing and Tensioning	
A. Torquing and Tensioning Basics	_____
B. Torquing Devices	_____
1. Laboratory	_____
Have trainees practice hydraulic torquing. This laboratory corresponds to Performance Task 1.	
C. Tensioning Devices	_____
1. Laboratory	_____
Have trainees practice hydraulic tensioning. This laboratory corresponds to Performance Task 1.	
D. Torquing and Tensioning Hazards; Tool Maintenance	_____

Session VI. Review and Testing

A. Trade Terms Quick Quiz _____

B. Module Review _____

C. Module Examination _____

1. Trainees must score 70% or higher to receive recognition from NCCER.
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

D. Performance Testing _____

1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

Troubleshooting and Repairing Conveyors
Annotated Instructor's Guide

Module 32502-09

MODULE OVERVIEW

This module explains how to maintain, troubleshoot, and repair conveyors, including how to splice belts and replace sprockets, bearings, and conveying devices.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum*; *Industrial Maintenance Mechanic Level One*; *Industrial Maintenance Mechanic Level Two*; *Industrial Maintenance Mechanic Level Three*; *Industrial Maintenance Mechanic Level Four*, and *Industrial Maintenance Mechanic Level Five*, Module 32501-09.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. Maintain, troubleshoot, and repair belt and roller conveyors.
2. Maintain, troubleshoot, and repair chain conveyors.
3. Maintain, troubleshoot, and repair screw conveyors.
4. Maintain, troubleshoot, and repair pneumatic conveyors.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Simulate splicing a belt.
2. Repair one of the following:
   - Belt conveyor
   - Chain conveyor
   - Screw conveyor
   - Pneumatic conveyor

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Gloves

Straightedge

Tape measures

Plywood or other suitable surface on which to cut and repair belts

Mechanical belt fasteners or other splicing materials

Conveyor setups or broken or damaged conveyors for the repair of belt, chain, screw, or pneumatic conveyors

Damaged drive rollers, sprockets, and bearings

Damaged chains, sprockets, and carrying devices

Maintenance manuals for belt, chain, screw, and pneumatic conveyors

Replacement links for chain conveyors

Replacement belt materials

Sling and hardware for rigging

Tools for marking, measuring, cutting, and splicing conveyor belts

Tools for installing replacement links

Allen wrenches

Arbor press or length of pipe to install bearings

continued

Assorted screwdrivers
Bearing pullers
Grease gun and lubricant
Needle-nose pliers
Torque wrenches
Copies of the Quick Quizzes*
Module Examinations**
Performance Profile Sheets**

* Located at the back of this module

**Located in the Test Booklet

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to repair conveyors. Ensure that all trainees are briefed on appropriate shop safety procedures. This module may require that the trainees visit job sites. Ensure that trainees are briefed on site safety policies prior to any site visits.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Rexnord Power Transmission and Conveying Components, Catalog #R85, 1984. Atlanta, GA: Rexnord Inc.

Goodyear Belt Splicing Manual. Akron, OH: Goodyear Tire and Rubber Co.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 12½ hours are suggested to cover *Troubleshooting and Repairing Conveyors*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	**Planned Time**
Sessions I-II. Introduction; Maintaining, Troubleshooting, and Repairing Belt and Roller Conveyors	
A. Introduction	_____
B. Maintaining and Repairing Belt and Roller Conveyors	_____
C. Laboratory Have trainees simulate splicing a belt. This laboratory corresponds to Performance Task 1.	_____
D. Laboratory Have trainees practice repairing a belt conveyor. This laboratory corresponds to Performance Task 2.	_____

Sessions III-IV. Maintaining, Troubleshooting, and Repairing Chain, Screw, and Pneumatic Conveyors

A. Chain Conveyors _____

B. Laboratory _____

Have trainees practice repairing a chain conveyor. This laboratory corresponds to Performance Task 2.

C. Screw Conveyors _____

D. Laboratory _____

Have trainees practice repairing a screw conveyor. This laboratory corresponds to Performance Task 2.

E. Pneumatic Conveyors _____

F. Laboratory _____

Have trainees practice repairing a pneumatic conveyor. This laboratory corresponds to Performance Task 2.

Session V. Review and Testing

A. Module Review _____

B. Module Examination _____

1. Trainees must score 70% or higher to receive recognition from NCCER.
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

C. Performance Testing _____

1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.