

# Reciprocating Gas Compressors

OIL AND GAS PRODUCTION



Petroleum Extension-The University of Texas at Austin

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## How to Use This Manual

The format of this manual includes a set of specific objectives for each section; at the end of the section is a competency self-test. To get maximum benefit from the manual, read the specific objectives carefully before studying the material in each section. As you study the material in the section, take notes, using the objectives as a guide to the most important parts.

When you feel that you have mastered the objectives, begin the self-test. Since it is a self-test, *you* decide whether you should refer back to the material to answer the questions by determining how important that section is to your work. If you feel that you need to be very competent in an area, do not refer back until you have finished the test. In this way, using the scoring points given at the beginning of the test, you can determine your percentage of competency. Score the test by using the corresponding key provided at the end of this manual.

# 1

## System Design and Components

### OBJECTIVES

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

1. Describe the function and uses of a reciprocating gas compressor.
2. List the major parts of a reciprocating gas compressor.
3. Define *prime mover*, or *driver*, as applied to a compressor.
4. Compare a two-stroke cycle engine with a four-stroke cycle engine.
5. List three ways a prime mover and a compressor may be connected, and give one advantage for each type of connection.
6. List six considerations necessary when selecting a compressor unit.

# 2

## Safety and Auxiliary Equipment

### OBJECTIVES

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

1. Explain why shutdown devices are needed for compressor engines.
2. List nine situations that may cause an emergency shutdown of a compressor.
3. Name two methods of shutdown generally used in shutdown devices.
4. List the different kinds of auxiliary equipment and describe the function of each.



# 3

## Design of Components

### OBJECTIVES

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

1. List the factors involved in the choice of a cylinder design and in the choice of material for construction of a cylinder.
2. Compare the advantages of the valve-in-body cylinder design and the valve-in-head cylinder design.
3. List five types of pistons used in compressors.
4. Describe the equipment commonly used to suppress pulsations.
5. Describe the function of a compressor valve.
6. Define the force that operates compressor valves.
7. Relate the sequence of events revealed by a piston velocity indicator card.
8. List the two primary objectives in designing a valve.

# 4

## Calculations

### OBJECTIVES

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

1. Determine piston displacement.
2. Calculate the compression ratio for a stage of compression.
3. Find the ratio of specific heats for a gas.
4. Compute the volumetric efficiency of a cylinder
5. Calculate the horsepower required to compress a given volume of gas under stated conditions.
6. Determine the capacity of a cylinder compressor.
7. Calculate compressor rod loads.
8. Predict discharge temperatures.

# 5

## Operation

### OBJECTIVES

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

1. Describe the seven factors that affect compressor unit capacity and developed horsepower.
2. Explain how the permanent clearance and the temporary clearance of a cylinder may be changed.
3. Describe the six methods of taking advantage of field changes to achieve more efficient utilization of existing compressor horsepower.
4. List four ways in which high plant inlet pressures can be obtained.

# 6

## Maintenance

### OBJECTIVES

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

1. Differentiate between the types of maintenance and rate their relative values.
2. Identify the indicators (symptoms) of beginning failure of engine parts.
3. Identify the symptoms indicating types of bearing failures.
4. Identify the causes of power valve failures.
5. Identify the causes of abnormal mechanical action.
6. Describe the checks that should be made in a routine inspection.
7. Describe the safety precautions that should be followed when repairing compressor units.

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