

1. Design problem

At the SmartBoard with the full version of Automation Studio, design a circuit for waste handling system with a single power unit that:

- operates two compacting cylinders that push the trash down into the container. The operator should be able to extend the cylinders to compact the trash, and otherwise, they should be in a retracted position to allow more trash to be loaded. There is no need to stop these cylinders in a mid-position. The trash container is limited to a total force of 7500 #, so be sure to install a component that will make sure this total force is not exceeded. The cylinders are both 4 inch bore and 36 inch stroke. The cylinders should extend fully in 5 seconds.
- drives a motor to shred trash. This motor should run any time the machine is on, but the operator should have control to reverse the motor for short periods in the event of a jam. When the motor is operating at full speed, it will use 70 gpm of oil. At times, this motor needs to run at the full 2400 psi to generate the necessary torque.
- controls a dump cylinder. This single acting cylinder needs to exert a force of 800 # in extension and should be prohibited from ever applying more than 2000 #. This cylinder needs to be stopped and held in various positions so that dumping can be completed. This cylinder is a two inch bore and 14 inch stroke. A full dump stroke should take no more than 10 seconds.
- Be sure that system pressure doesn't ever exceed 2400 psi. Provide a gage at the pressure relief for operator feedback.

Design the system and run it. Capture the various modes of operation and annotate the schematic. Report the key data such as: minimum required pump flow, reducer setting on dump cylinder, reducer setting on compactor branch, etc. Provide a full explanation of the components, when they operate, etc.

Lab Session 4 (cont.)

2. Analysis Problem

Examine the circuit below and discuss its design. Identify each component. What is its purpose? How does it operate? For what applications would it be appropriate?

Build the circuit in Automation Studio and operate it. Capture the circuit in various modes and document the operation of the various components. Explain clearly its operation. Record key data like max forces developed in extend and retract modes, extend and retract speeds, and power consumed by the circuit in the center position. Capture many images and annotate them for clarity.

