

Dangers of Overfilling CO₂ Cylinders

Overfilling a CO₂ cylinder, be it an attempt to get longer service out of one charge of a cylinder or be it accidental, can have unexpected and even catastrophic consequences due to the expansion characteristics of the CO₂ charge.

We at Catalina Cylinders have heard many times that it is not fair that a CO₂ cylinder is deemed full at only 68% of its water capacity, that there appears to be 32% of its water capacity that is not being used, or wasted, and that this capacity not being used could be used for extended service life of one CO₂ charge. This 32% is not spare, or wasted, capacity. Following are three situations that identify why this 32% of the total water capacity of a CO₂ cylinder is not spare, or wasted, capacity.

1. A 20# CO₂ cylinder with a full charge (68% of its water capacity)

When a fully charged, 68% full by water capacity, 20# CO₂ cylinder warms up to room temperature (70⁰ F), the pressure inside the cylinder is 837psi. When the cylinder reaches 87.9⁰ F the entire charge becomes a gas no matter what the pressure. A fully charged CO₂ cylinder at 87.9⁰ F will have an internal pressure of approximately 1100psi. At 120⁰ F a fully charged CO₂ cylinder will have an internal pressure of nearly 2000psi, this is greater than the designed service pressure of 1800psi of the cylinder. Remember that this cylinder at 120⁰ F has an internal pressure greater than the marked service pressure of the cylinder and is properly filled, not overfilled. Also note that 120⁰ F is not an excess temperature and can quite easily be reached in many different environments (i.e. in a shed or a vehicle on a hot day or in a kitchen).

2. A 20# CO₂ cylinder with a 5# overfill (85% of its water capacity)

The following would occur if a 20# CO₂ cylinder were slightly overfilled with 25# of CO₂ charge to increase its service life between fills. When the cylinder and charge warm to room temperature the internal pressure of the cylinder would be 1430psi. If the cylinder were warmed to 103⁰ F the cylinder would vent through the safety device of the valve. This venting would most likely be unexpected since it would not be known when the cylinder would warm to 103⁰ F. Unexpected venting through the safety device of a valve has caused property damage and personal injury.

3. A 20# CO₂ cylinder greatly overfilled (95% of its water capacity)

A 20# CO₂ cylinder filled to 95% of its capacity, not quite liquid full would vent through its safety prior to the cylinder reaching room temperature, 70⁰ F. If the safety disc has been altered and reinforced and would not actuate, the cylinder would rupture between 85⁰ – 95⁰ F. Rupturing cylinders have caused severe property damage and serious personal injury, even loss of life.

Accidental overfilling or overfilling due to inaccurate equipment (i.e. the scale being used in the filling process not being calibrated or not being able to measure in small enough units of measure to accurately fill small cylinders) will have the same results as purposely overfilling a cylinder. The effects of accidental overfilling of a small CO₂ cylinder can have catastrophic affects as described below.

A 2.5# CO₂ cylinder filled accidentally with 1 extra pound of CO₂ will be filled to 95% of its capacity. As stated above, a cylinder filled to 95% of its water capacity would vent through its safety device before the cylinder warms to room temperature.

In summary, never overfill a CO₂ cylinder, on purpose or accidentally. The affects of overfilling coupled with the effects of increasing temperature on the CO₂ charge, will greatly increase the probability that something catastrophic could happen to property or personnel. Do not take the risk, do not overfill a CO₂ cylinder.