TECHNICAL PAPER

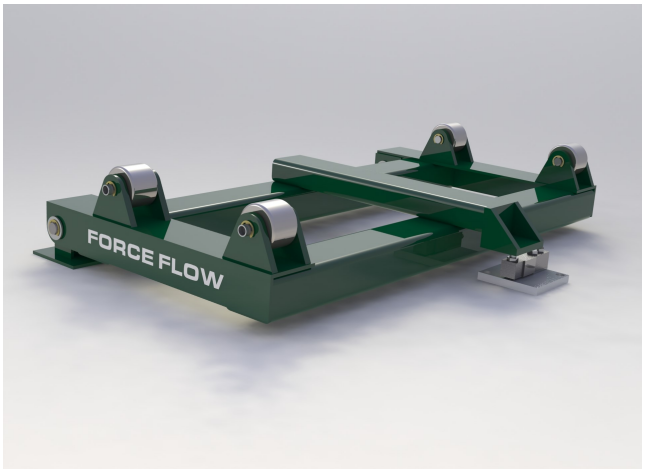
101

Theory of Operation

ELECTRONIC CHLOR-SCALE® SINGLE TON CONTAINER SCALE

When introduced in 1967, the Chlor-Scale® was the first pivoted, single load cell scale designed from the ground up for monitoring the amount of chlorine or sulfur dioxide in commonly used ton containers. The Chlor-Scale today continues to provide an easy and accurate method for plant operators to track how much chemical is being fed and how much remains in the container. This information provides operators with proof that the correct amount of chemical was dosed and warns them when the tank is approaching empty to help prevent a potentially hazardous unintended "no-feed" condition.

The Chlor-Scale® electronic single ton container (*also often referred to as a tank, tonne drum, or cylinder*) scale system consists of a heavy duty robotically welded 2-part epoxy powder coated steel platform (*frame*) with four trunnion wheels (*rollers*), an electronic load cell with integral cable, and a digital weight indicator.



HOW A PIVOTED WEIGH PLATFORM WORKS

Our pivoted platform design has two frame feet (*hinge feet*) located on one side of the platform with a flange located on the opposite side which rests on a load cell. The load cell is not physically connected to the platform but instead is anchored to the ground. This configuration allows the scale frame to pivot down onto and freely rest on the load cell.

Two critical factors allow a pivoted, single load cell platform to be ideal for this application. First, the integral trunnion wheels on the frame position each tank so that the center of gravity of the chemical inside is always aligned in the exact same location from tank to tank. Second, as the amount of chemical changes, there is no change in the location of the center of gravity since the chemical is a self-leveling liquid in a cylindrical vessel.

Because of these two factors and the design of the platform, 50% of the total chemical weight is always supported by the frame feet while the other 50% is always supported by the load cell. So for every pound or kilogram of weight the load cell senses, another pound or kilogram is also being supported by the frame feet. Knowing this we can then calibrate our weight indicator using a 2:1 ratio so that for every pound or kilogram the load cell senses, the indicator displays two, which provides an accurate display of the total remaining chemical in the tank.

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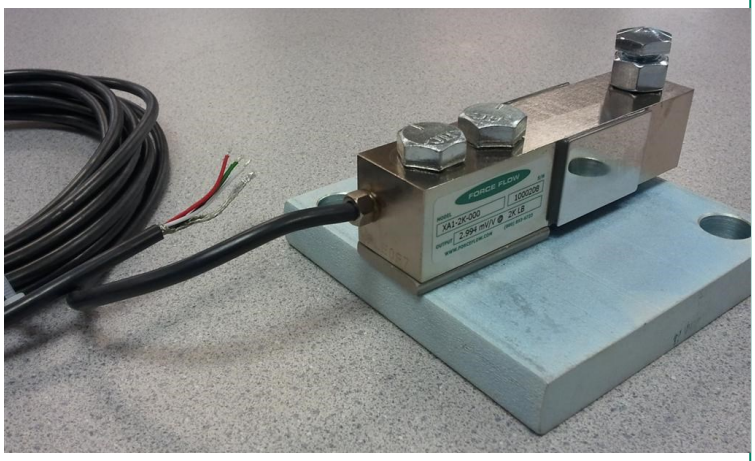
Theory of Operation *continued*

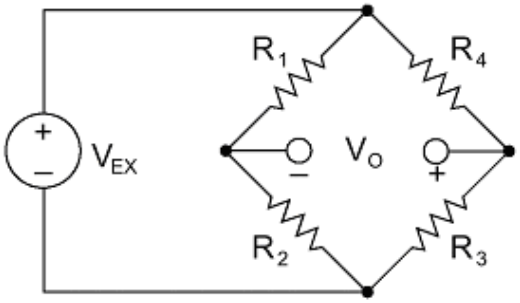
ELECTRONIC CHLOR-SCALE® SINGLE TON CONTAINER SCALE

LOAD CELL AND INDICATOR

Of the many different types of electronic load cells available, we selected the single-ended shear beam style for its ability to accurately measure compression loads and readily tolerate the effects of angular, eccentric and side loading, with minimal sensitivity to these anomalies. Our high performance, bonded foil strain gauge load cell is constructed of electroless nickel plated alloy tool steel and is sealed (IP67-Limited Immersion) by virtue of proprietary, multi-redundant barriers uniquely integrated to protect all internal components. The premium instrument grade cable features a durable polyurethane jacket over a tinned copper braided shield for superior mechanical protection and to minimize the unwanted electrical effects of RFI and EMI. The cable is connected internally to the circuitry and to insure proper sealing, cannot be disconnected from the load cell.



The load cell has multiple strain gauges internally bonded to the beam. Each of these strain gauges consist of metallic foil arranged in a grid pattern. This pattern maximizes the amount of foil subject to strain in the parallel direction. When strain is experienced by the shear beam, the strain is transferred directly to the strain gauges which respond with a linear change in electrical resistance.



Wheatstone Bridge

To measure these small changes in resistance, the strain gauges are configured in a Wheatstone bridge circuit. A Wheatstone bridge is a network of four resistive arms with an excitation voltage that is applied across the bridge. Our weight indicators provide the load cell with 5 VDC of excitation voltage and the load cell then returns a millivolt DC signal proportional to the weight being sensed.

The advanced circuitry within our weight indicators converts the load cell signal from analog to digital, and through our microprocessor based electronics, we are able to provide an accurate, stable weight reading.

WIZARD 4000®

SOLO G2®

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