Question	Answer
Q What is "Bolt-on" Weight Measurement?"	A KM pioneered the development and application of the type of technology that is based on the silicant, semi-conductor strain gage. The device is attached to the support structure of the vessel with bolts. This device senses the changes in metal compression and expansion, amplifies the movement and converts it to an electrical signal.
Q What is a strain gage?	A Instrumental device used to measure dimensional change within or on the surface of a specimen.
Q What is stress?	A 1) Action on body of any system of balanced forces whereby deformation results. 2) Amount of stress, usually measured in pounds per square inch or Pascal's. 3) Load, force or system of forces producing strain. 4) Internal resistance or reaction of elastic body to external forces applied to it. 5) Ratio of force to area. In the case of vessels, it is a combination of the dead load (weight of the vessel and its structure), live load (weight of the material in the vessel), and external influences.
Q What is strain?	A Deformation of a body or structure as a result of applied force. In the case of bolt-on weight sensors, we are measuring the change in the vessels support structure caused by the weight of the material in the vessel. The typical cell measures in microinches.
Q What is a Microcell®?	A KM's half bridge strain gage device used to transform mechanical deflection (support structure movement) into electrical signals.
Q What is an L-Cell®?	A KM's dual axis strain gage device used to transform mechanical deflection (support structure movement) into electrical signals and provide active temperature compensation.
Q Which is better, the Microcell or the L-Cell?	A As with all technologies, bolt-on weight measurement is constantly evolving. The Microcell was developed over 25 years ago. The L-Cell is a natural evolution with active temperature compensation and improved stability. The Microcell still is the only one that can be used on pipe legged vessels.

Question	Answer
Q What is psi?	A Pounds per square inch. The unit of measurement of stress used in applications of bolt-on technology sensors.
Q How do you calculate psi?	A For legged vessels, divide the maximum design weight value by the total number of cross sectional square inches in the support structure. For horizontal beamed vessels, divide the maximum design weight value by two times the number of support points. The resulting value is divided by the shear area of the support beam. For skirted silo vessels, multiply the diameter in inches times 3.14 times the skirt thickness. Divide the maximum design weight value by the results.
Q What is the shear area of a beam?	A The shear area of a beam is the width of the web from outside flange to outside flange times the thickness of the web.
Q Is there a minimum psi that is required to apply bolt-on?	A Yes, psi's greater than 1200 are required for reliable performance in the 1-5% range for legged vessels. Skirted silos require a minimum of 2000 psi. The higher the psi, the greater the accuracy that can be expected. As psi values decrease, the accuracy decreases to a point of being totally unacceptable. There are published charts that list the psi vs. performance curve for the various bolt-on technology sensors.
Q Can bolt-on technology work on all vessels?	A Bolt-on technology sensors measure the stress in the vessel support structure and convert this into an electrical signal that can be converted to weight. The support structure must be made of metal, aluminum or steel, in order for the technology to work.
Q Can the environment affect the performance of bolt-on technology?	A Bolt-on technology sensors are subject to the same environmental conditions that affect load cells. Vessels located outside are subjected to heat and wind and this condition can be perceived as a weight change as the vessel moves around on its support.
Q What is the wind effect on a vessel weight system?	A If all of the support legs are instrumented, then Newton's equal but opposite law applies. There should be no detrimental affect on the weight system as long as the foundation is stable.

Question	Answer
Q Do I have to empty my vessel prior to installation of KM bolt-on technology?	A There is no reason to empty the vessel or halt production prior to or during the installation phase of the bolt-on weight system
Q What is the current requirement for the L-Cell?	A 11.8 ma worst case (below 0ºF at the sensor, >120ºF at the electronics).
Q What does the temperature do to a bolt-on weight system?	A A 25' diameter vessel will expand or contract as much as ½" due to climatic conditions. If the support structure is rigid, then the vessel will have a tendency to move around and cause bowing in the supports. This will appear as weight changes on the electronics. This is not a fault in the L-Cell but rather a result of the vessel physics. This same result will appear on load cell supported vessels if the legs are not allowed to float.
Q What influence will plumbing and piping have on bolt-on technology?	A The ideal weight vessel will have only three legs, no external connections and be located indoors in a controlled environment. Since we work in the real world, this technology is subject to the same influences as load cells. Piping and plumbing can cause inaccuracies due to weight transference. Proper decoupling of piping and plumbing, solid foundation support and minimizing of cat-walks and other structural add-on will improve the accuracy of the system.
Q My level system gives me a specified ¼ percent measurement accuracy. Why would I use a technology that will only give me 1-3 percent?	A Percent level measurement accuracy is not the same as weight measurement accuracy. Conversion of the level measurement to weight entails multiple conversions which can result in a weight inaccuracy of more than ±5%. If you process or account for material by weight, then the material should be weighed.
Q What is the accuracy statement based on?	A The accuracy statement is based on over 25 years of application experience utilizing bolt-on weight technology.
Q How do I calibrate my system after installation?	A As with any weight system, the most accurate method is material movement. In lieu of this method, an electronic calibration can be performed and then refined with material movement over time.
Q What is drift?	A Drift is apparent weight change when there has been no material movement. This is normally caused by foundation changes or vessel movement due to thermal heating and cooling.

Question	Answer
Q Why do my readings change in the morning and evening?	A This is normally caused by solar radiation producing vessel movements that are not relieved by the vessel support structure being allowed to move.
Q My vessel is designed for 100,000 pounds but I only use 50,000 pounds. Will this affect my accuracy?	A The vessel and its support structure were designed for 100,000 pounds. The psi calculations and accuracy statements are based on this design capacity. Using a smaller working capacity will not change the accuracy that is specified.