Long before baker’s yeast was readily available in supermarkets, leavening agents were needed for bread to rise. Leavening agents are important in baking because they react with the dough to form carbon dioxide, creating air pockets in the bread. The leavening process softens the bread to produce a sponge-like texture that many people, both past and present, have come to love. Sourdough bread is historically known as the first type of bread to use a leavening agent; this leavening agent was hence referred to as “sourdough starter.” This starter is a pre-ferment of flour which naturally contains bacteria in addition to yeast and water. The sugars which cannot be metabolized by yeast are instead fermented by the bacteria present. This process produces lactic acid, which is responsible for the slightly sour taste that is characteristic of sourdough bread. The consequent by-products produced by bacterial fermentation are then metabolized by the yeast, which produces the carbon dioxide. In order to produce a stable starter culture, the pH and total titratable acidity are closely monitored. The ideal pH of sourdough starter is between pH 3.5 and 4.1. The total titratable acidity of the starter is measured as the volume of base required to reach a pH of 6.6 based on an American Institute of Baking standard method. On average, 14 to 16 mL of 0.1N NaOH is added to a 20 gram sample size. If the volume of base added to the starter is outside of this ideal range, the ability for carbon dioxide formation decreases, potentially leading to a dense, unappealing end product. To ensure accurate and consistent breads, bakers must measure the pH and the total titratable acidity in their sourdough starters.

A bakery approached Hanna Instruments because they wanted to improve the quality and consistency of their sourdough bread. They were performing timely manual titrations, which they found lacked in terms of accuracy. Hanna Instruments offered the HI902C Automatic Titration System and FC210B pH electrode. The HI902C is a versatile machine that allows for users to fully customize their titration methods. In this case, the customer was able to program a titration which utilized a fixed endpoint at pH 6.6. The bakery previously used manual titration to determine their endpoint, but they realized over-titration was a common error encountered with this method. With automatic titration, the endpoint is precisely determined due to a much smaller minimum dose size than they were achieving in their manual titrations. Aside from being a sophisticated titration system, the HI902C also has an advanced pH meter mode. Because their titration is to a fixed pH endpoint, ensuring the electrode is in good working condition and has a valid calibration was important for their titration accuracy. The extensive GLP data assured the customer that their pH electrode was in good working condition. As sourdough starter can be very thick, deionized or distilled water is commonly added as part of the sample preparation. The HI902C methods can be optimized so a pre-titration stir time may be set, ensuring a more fluid, homogeneous mixture. The open junction feature of the FC210B pH electrode ensured they would not encounter any clogging issues from the viscous dough mixture. Because the sourdough starter is particularly thick, after multiple measurements, a sticky residue may develop on the pH glass. The HI7073 Electrode Cleaning Solution for Proteins can be used to quickly and easily remove the residue from the probe. Overall, the customer was very pleased with the results and functionality of the HI902C system, as it allowed for them to improve the quality and uniformity of their bread.