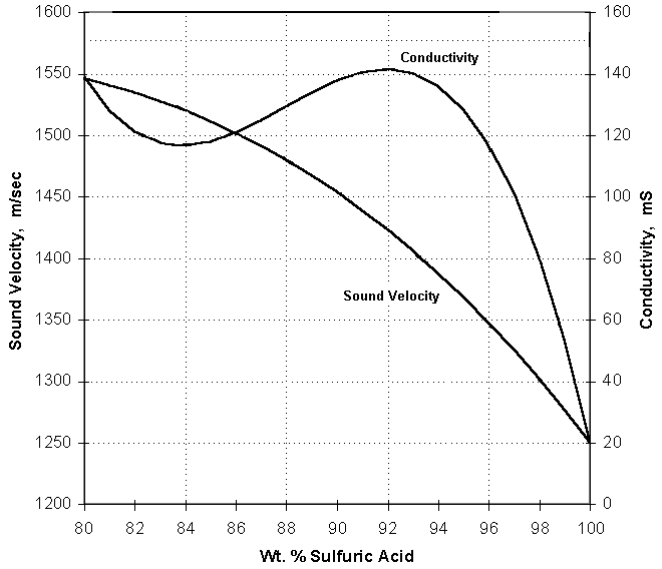
Accuracy and Response Curves

The accuracy of inferential analyzers depends (among other things) on their response curves. The measured variable must change in response to the variations in the composition that are being monitored. The greater the change in response to unit change in composition, the more accurate the analyzer will be. **When comparing *different* inferential analyzer types, application accuracy will be determined by both the response curve and the accuracy specifications for the measured variable.**

Take for example the Model CP20, with an accuracy specification of ±0.20 meters/sec and a similarly priced densitometer with a specification of ±0.001 SGU. While ± .001 accuracy looks better than ±0.2, in a vinegar (acetic acid) solution, a 0 to 5 Wt. % change results in a 20 meter/second change in sound velocity, and a 0.0070 SGU change in density. In this example, the accuracy for the Model CP20 is (±0.20 m/sec) ´ (5 Wt. % / 20 m/sec) = ± 0.05 Wt. %, and for the densitometer it is (±0.001 SGU) ´ (5 Wt. % / 0.0070 SGU = ±0.71 Wt. %, a substantial difference.



Many response curves have humps and valleys such that different compositions have the same measured variable. This poses a complication in reporting the measured variable. An example is the analysis of sulfuric acid strength by conductivity: both 89 % and 95% have a conductivity of 130 mS (see graph below). When 130 mS is observed, it can be inferred that the acid's strength is either 89 or 95%, but *not* which of these is the correct answer. It is therefore never advisable to use an inferential analyzer to measure in a range where its response curve flattens or humps over. It is during start-up or upset conditions that a narrow range analyzer could falsely

report a believable measurement, During these conditions a wide range analyzer will provide the greatest benefits.

In some applications the response curves for sound velocity also have these humps and valleys. In most cases these occur at different concentrations than other types of analyzers. In many cases, such as with most salts and caustics, there is no hump in the sound velocity response curve even though there is in the curves of other analyzer types. Thus, the CP20 can often provide a much greater operational range or perform in ranges that other analyzer types simply cannot. To assist you in evaluating analyzer types, **NuSonics Div. will provide an accuracy statement in your measurement units, applicable to your process concentration and temperature ranges**.