Process Controls SalesNet

pH Applications

pH Measurement and Control in the Manufacture of Sugar

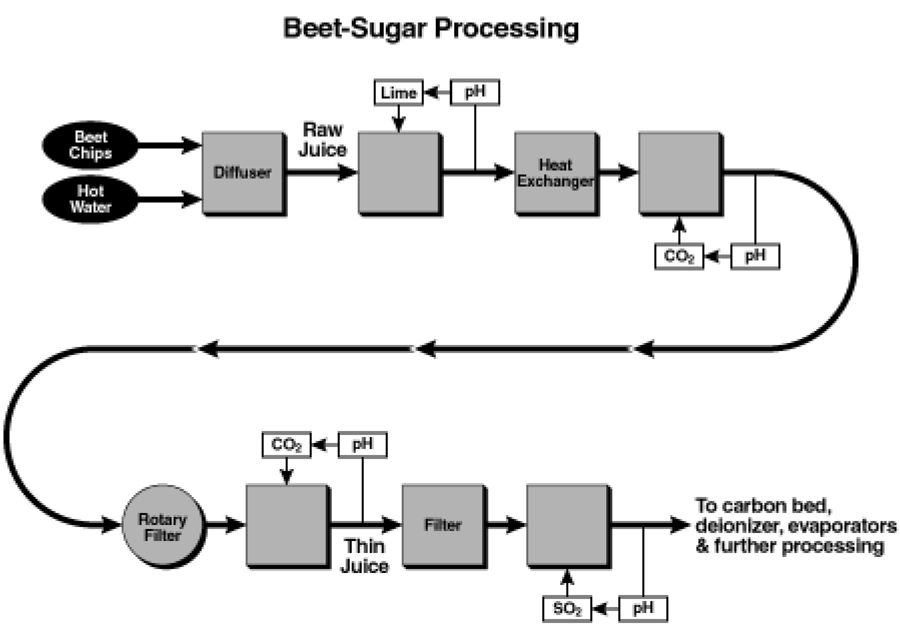
Accurate measurements ensure that your best ingredients produce the best products.

Non-glass pH Electrode Capabilities

- Reliable Durafet® solid state pH electrode withstands hot, abrasive conditions
- Ion-Sensitive Field Effect Transistor (ISFET) sensor eliminates fragile glass membrane
- Fast, 1-second response is typical
- Measurement is accurate, with no sodium or ORP interference.

Background

After extraction from sugar cane or sugar beets, juice must be purified to remove the many other organics and minerals that accompany it.



The processing to accomplish this is heavily dependent on reliable pH measurement and control as illustrated in the accompanying figure. Described are the early stages of treatment for the manufacture of beet sugar. Cane sugar processing uses many of the same operations.

Thorough washing of the sugar cane or beets is followed by crushing or cutting into chips and counter-current extraction of the sugar by hot water in a diffuser. The resulting "raw juice" is treated with milk of lime (calcium hydroxide slurry), based on pH controlling to a set point of 10.5 to 11.5 pH. Some of the impurities begin to precipitate and the juice is stabilized, preventing decomposition at the elevated pH.

Liming is followed by carbonation where the sugar solution is heated and carbon dioxide is added by pH control. Impurities and calcium carbonate precipitate together and can be readily separated and filtered. Optimum purification is achieved through two stages of carbonation, which allow removal of impurities at an intermediate pH level where they have minimum solubility. Close pH control is necessary at each stage to assure maximum removal of both impurities and calcium.

The resulting "thin juice" is maintained at high temperature and treated with sulfur dioxide to lower pH further, removing any remaining impurities and calcium, and bleaching the sugar. Again, pH control is essential to efficient operation. The sugar juice is then heated to drive off any residual gases and provide a neutral product.

Further purification sometimes uses carbon beds and ion exchange resins, to remove the last traces of color and impurities. (Conductivity measurement is a key variable in monitoring the operation and regeneration of ion exchange operations.) The purified thin juice then moves on to multi-effect evaporators for concentration, vacuum pans for crystallization, centrifugal separators and dryers.

pH Electrode Requirements
pH electrodes must stand up to process conditions encountered in the liming and carbonation stages, to provide consistent measurement. The non-glass, Durafet electrode is a major improvement in the reliability of pH measurement in this type of application. Based on unique ion-sensitive field effect transistor technology, it eliminates the fragile glass membrane and the associated risk of breakage. Gone are the liabilities of glass contamination of product and costly downtime.

Durafet electrode response eliminates the high impedance circuitry and vulnerability to insulation breakdown of glass membrane electrode signals. They have no ORP (oxidation-reduction potential) interference which is a requirement in the reducing environment of sulfur dioxide addition. There is negligible sodium ion error at high pH and exceptionally fast pH response—typically within 1 second. This can save a substantial percentage of reagent and provide more uniform control. In each of the applications given here, the Durafet electrode generally out-performs glass and other types of pH electrodes.

Long life of the solid state pH sensor is complemented by a reference electrode section with replaceable junction and gel electrolyte. The large junction area resists clogging but can be easily replaced when necessary. No pressurization of the reference electrode is required. The probe also includes an integral temperature compensator to provide a compensated pH signal compatible with a variety of instrumentation.

Durafet electrodes can be used with the full line of Honeywell analyzers and two-wire transmitters. In addition, adapter modules are available to electronically interface the Durafet electrode to existing analyzers of nearly any manufacture.

A simple solution.

Tomorrow's standards that Honeywell is setting today with the Durafet pH electrode include:

- Solid-state ISFET sensor is virtually unbreakable.
- Response has no sodium ion error or ORP interference.
- Replaceable reference junction and gel reduce maintenance costs and increase electrode life.
- Built-in counter electrode improves measurement stability.
- Easily retrofits to existing systems, because it works with almost any analyzer.
- A complete selection of housings is available for insertion, submersion, sanitary, and removable mounting into pipelines or vessels.

The Durafet pH electrode is another example of Honeywell's powerful technology giving you a simple solution that increases productivity, ensures product quality, saves time, and increases process profitability.

[**Return to Top**] [**Return to Applications Homepage**]