Pharmaceutical Process Control

Applications
Pharmaceutical
Chemical

Departments
Research
Production

Overview

Pharmaceutical products are produced under carefully controlled conditions to ensure product quality. Each process is different and requires close attention to detail. Sterilization, fermentation, extraction, neutralization, filtering, freeze drying, and centrifuging are typical processes found in this industry.

Problem

The development of new medicines requires a variety of measurements in several different processes. The instrument used must be accurate and flexible enough to accommodate these demands. In some cases, the instrument may need to control a portion of the process while it measures the results.

Solution

A VXIbus data acquisition and control system from VXI Technology makes an excellent process evaluation tool for users in the pharmaceutical industry. Accurate monitoring and precise control ensures that a new process is tested thoroughly. By characterizing the process, production costs can be lowered and product quality can be improved. A standard commercial graphical programming language and computer offer easy operator interfacing, data analysis, storage, and report generation.

Implementation

Process Temperature

Temperature is an important measurement in most pharmaceutical processes. Often, temperature is used to control the speed of a chemical reaction. Thermocouples, RTD's, or thermistors are used with a data acquisition instrument to measure process temperatures. The data acquisition instrument can control heaters or chillers to change temperature in the process.

Application Note

Process pressures, pump control, and valve control

In some processes, maintaining proper pressure is crucial to obtaining the correct chemical reaction. Pressure transducers usually output a voltage or current proportional to pressure. Pressure can be controlled by actuating pumps and valves.

Process flows

Some processes are continuous and require a certain flow rate to be maintained for one or more chemicals entering the reactor vessel. Flow meters (analog output or pulse train output) can be used for monitoring. Digital-to-analog converters control flow rate by setting proportional valve position.

Chemical composition

The density of ions like bromide, calcium, chloride, fluoride, nitrate, sodium, and sulfide can be measured with transducers. The acidity (pH) may also be important in the process. With careful monitoring and control over the amounts of chemicals entering a process, the correct chemical composition can be maintained.

Tank level

To reduce costs, proper liquid levels in tanks must be controlled throughout the process. Excessive levels require extra chemicals while diminished levels could result in improper chemical composition. Both digital (point level sense) and analog (continuous level sense) techniques are commonly used.

Agitator control

An agitator is used to mix solids, liquids, or gases thoroughly. Shaft encoders can be used to monitor the speed of the agitator while torque transducers can be used to monitor the consistency of the product being agitated.

Product weight

Solids can be accurately measured by weight using load cells which provide a linear voltage output or bridge output that can be measured by the data acquisition system.

Key System Features

- **VXIbus open architecture**
- **Data Acquisition and Control on a single programmable VXIbus card (VT1419A)**
- **Graphical programming language (Agilent VEE or NI Labview)**
- **Flexibility with deterministic control**
- **Wide choice of inputs/outputs**
- **Built-in control algorithms**
- **Up to 32 user-written "C" code algorithms**
- **65,000 reading FIFO buffer**
- **500 reading Current Value Table(CVT)**
- **All algorithms can write to FIFO/CVT**
- **Data can be time-stamped**

Typical Configuration

Data Acquisition System	Qty
C-100C VXI 6-Slot Card Cage	1
Firewire VXI Slot 0 Command Module	1
VT1419A Multifunction Measurement & Control Card	1-3
Analog input channels	40-100
Strain gage completion channels	1-5
Counters channels	2-10
Voltage DAC channels	8-16
Pulse output channels	1-5
Digital input channels	16-32
Digital output channels	20-60