

# CONTINUOUS NEUTRALIZATION OF ACID/ALKALINE INDUSTRIAL WASTE

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## BACKGROUND

Continuous neutralization of acid or alkaline industrial wastes is preferable to batch neutralization in three situations: when there is a high volume of waste, roughly 190 l/min (50 gpm) or more; when the hold-up time in the reaction tank is less than five minutes; or when there are wide swings in the pH value of the waste (roughly 3 pH units or more). Reliable neutralization under any of these conditions requires a proportional-plus-reset control system, as opposed to simple on-off control.

### Continuous Spent Acid Neutralization

In the system shown in Figure 1, spent acid continuously flows into the reactor tank(s). A submersion pH sensor is used to measure the pH value, which is transmitted via the pH analyzer/transmitter to a PLC or DCS. The 4-20 mA control signal is converted to a pneumatic, 3-15 psig, signal to operate a control valve for the addition of alkaline reagent. The Model 54e can also be used for control where a DCS or PLC is not needed because it contains an optional integral PID (proportional integral derivative) or TPC (time proportional control) controller.

Coating of the pH sensor by undissolved materials in the waste stream leads to lower responsiveness to changes in the sample pH and poorer control. In cases where severe coating is anticipated, the pH sensor of choice is the 396P TUpH™ Sensor.

## Rules to Follow for Continuous Control of pH

1. Thirty seconds to five minutes of hold-up time is good. One to three minutes is the optimum. Less than thirty seconds is impractical and often will not work. This applies to each reaction vessel, single stage or multistage.
2. On-off, continuous control will work as well as proportional-plus-reset control if the hold-up time is 15 minutes or longer.
3. Agitation is critical. The turnover time should be 5 to 10 percent of the hold-up time.
4. A one tank system can give good control if no larger than a 3 pH unit change is possible at the input.
5. Two tanks will be required if the change is larger than 3 pH units. Three tanks will be required if the change is larger than 5 pH units.

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## INSTRUMENTATION

### Model 54e pH Microprocessor Analyzer

- Comprehensive pH glass and reference diagnostics warn user of the need for calibration, maintenance, or sensor replacement.
- Heavy NEMA 4X (IP65), enclosure of epoxy-painted aluminum.
- Fully descriptive diagnostic messages and easy-to-use interface spell out each operation in English, French, German, Italian, or Spanish.
- Optional TPC & PID control capability



### Model 5081-P pH/ORP Smart Two-Wire Transmitter

- Hand-held infrared remote control link activates all the transmitter functions.
- Large custom LCD display.
- NEMA 4X (IP65) weatherproof, corrosion-resistant enclosure.
- Non-volatile EEPROM memory holds data in event of power failure.



### Model 396P pH/ORP TUpH Sensor

- Polypropylene reference junction means longer sensor life in process solutions containing heavy solids.
- Disposable, one-piece construction is convenient and economical where minimal troubleshooting and maintenance downtime are of prime importance.
- Versatile. Can be used in numerous loop configurations with all Rosemount Analytical and other manufacturers' instruments.

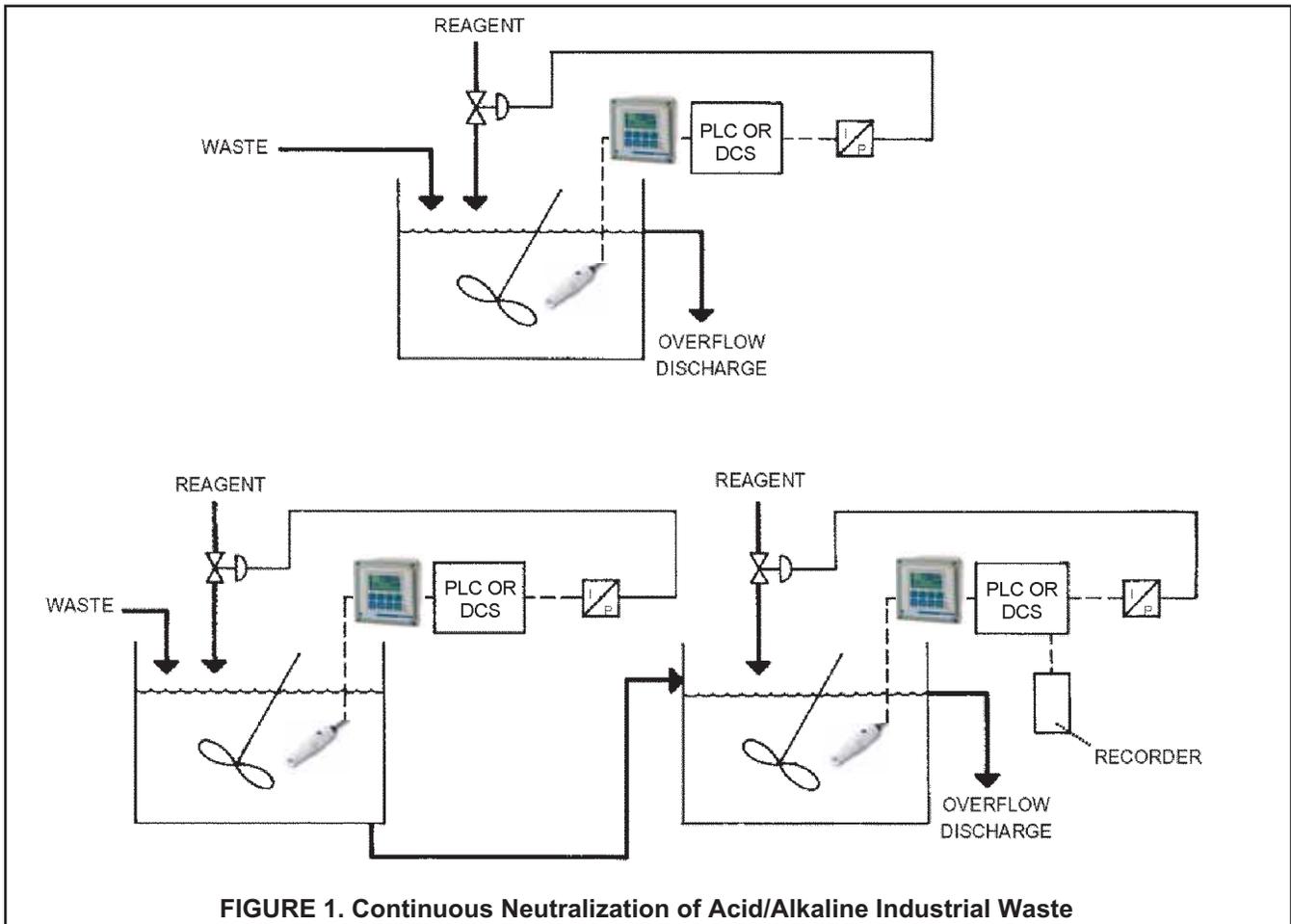


FIGURE 1. Continuous Neutralization of Acid/Alkaline Industrial Waste

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