Modern Sustainable Cyanide Destruction Control

Industrial Process Description

Cyanide-containing waste is produced in various industries such as mining and electroplating. Processes such as stripping, cleaning, and plating generate wastes that can include metal cyanide complexes with alkaline iron, nickel, zinc, cadmium, copper, silver, and gold. Wastes containing cyanide are required by both US EPA law 40 CFR part 413 & 433." and Ontario, Canada, 560/94 to be discharged below 1 ppm monthly. These levels may be decreased in the future. Therefore, it is best for an effective approach to be taken so that cyanide levels are discharged at the lowest level that is economically and technically feasible.

Cyanide Process Sustainability

While Cyanide usage and disposal can present a significant risk. Current industry techniques for management of cyanide ensures the protection of human health and the environment.

Cyanide usage and disposal methods in mining and other industries is a safe and effective process. However, society's increasing concern in regards to environmental issues, paired with incidents involving the accidental release of cyanide, has placed society's focus on the approach the mining industry is taking in regards to the usage and control of cyanide. It is important for mining and all cyanide usage industries to act with duediligence, and achieve best practices in cyanide management.

Processes

Cyanide waste treatment can be separated into three categories, based on the size and flow of cyanide waste outputs.

1) For small users with a low volume of cyanide waste, single tank timed batch controls using sodium hypochlorite are typically used. See illustration 1 for a process visual.

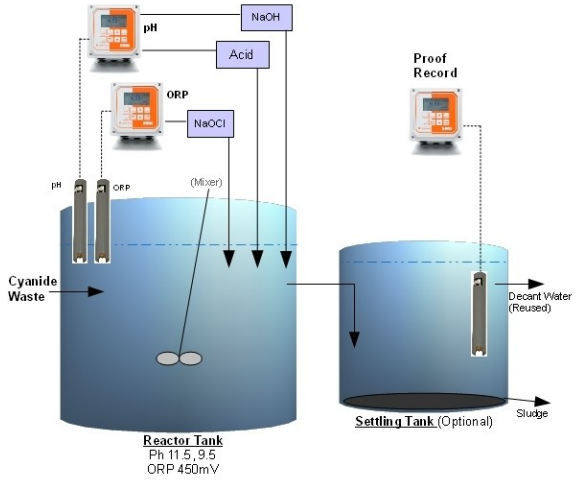

Illustration 1: Single Tank Timed Batch Control

2) The most common method of cyanide waste treatment consists of two reaction tanks operated at a high pH using sodium hypochlorite reagent. This process is for larger operations with increased cyanide waste outputs such as electroplaters and other mid sized operations, and small mines.

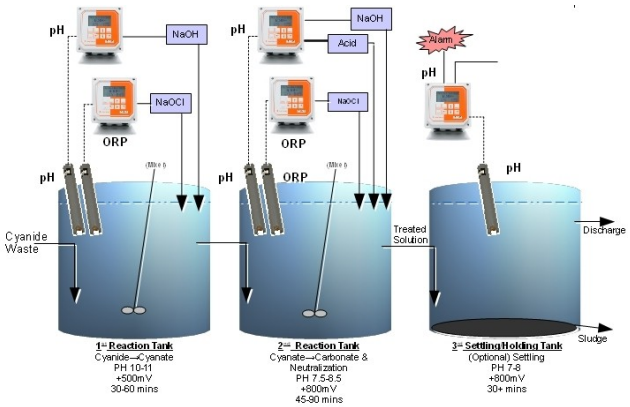

Illustration 2: Dual Tank Cyanide Destruction

In the first tank, conditions are adjusted to oxidize

cyanides to cyanates, the solution pH is raised to approximately 10 – 11. Chlorine gas or sodium hypochlorite is then added to achieve an ORP level of approximately +500 mV. The solution reacts for 30 - 60 minutes while the cyanide is oxidized to cyanate. In the second reaction tank, conditions are maintained to oxidize cyanate until it breaks up into carbon dioxide and nitrogen. The solution pH is lowered to 8.5 - 9.0 and additional chlorine is added until the ORP is at a level of approximately +800 mV. This reaction takes 45 - 90 minutes and will oxidize the cyanate to sodium bicarbonate and nitrogen. An additional tank may be added for holding and final pH adjustment to meet discharge limitations. This method is commonly reputed to drop cyanide levels to less than 0.1 ppm. See illustration 2 for a process visual.

3) The Sulphur Dioxide and Air processes. There are two versions, the INCO SO_2 and Air process available from SGS Mineral Services or Cyplus (Degussa), plus an alternative from Noranda. They are patented processes used for gold and precious metal mines with large, steady flows of cyanide waste output from operations. They have a number of advantages such as low reagent costs as the reagents are SO^2 and Air, plus soluble copper as a catalyst. The cyanide is oxidized to cyanate at a pH of 8 to 9 which must be maintained with lime to counteract byproduct H_2SO_4. Where WAD (weak acid dissociable) cyanide, iron cyanide, and other metals complexes are included more pH precipitation stages are used. See illustration 3 for a process visual.

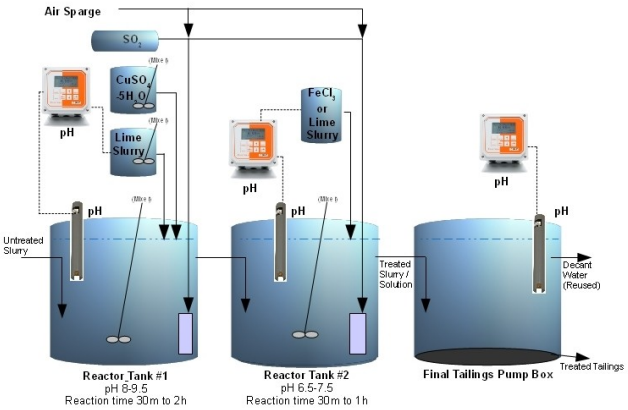

Illustration 3: INCO SO2 / Air process

Cyanide Process Sustainability

Cyanide and WAD Cyanides are toxic and hazardous substances. Usage and disposal can present a significant risk. Current industry techniques for management of cyanide ensures the protection of human health and the environment.

Cyanide usage and disposal methods in mining and other industries is a safe and effective process. However, society's increasing concern in regards to environmental issues, paired with incidents involving the accidental release of cyanide, has placed society's focus on the approach that mining and other industries are taking in regards to the usage and control of cyanide. It is important for mining and all cyanide usage industries to act with duediligence, and achieve best practices in cyanide management.

The mining industry has addressed the need for continuous improvements and management. Ensuring your process uses the most advanced and precise water quality measurement instrumentation will help achieve compliance, even for tightening regulations.

Technological advancements in today's industry processes allows for less cyanide needed in industrial process and the ability to reuse or break down cyanide more effectively and more efficiently. IC Controls measurement instruments enable precise and exact measurements, allowing for efficient cyanide destruction and lower consumption of energy and water resources.

IC Controls
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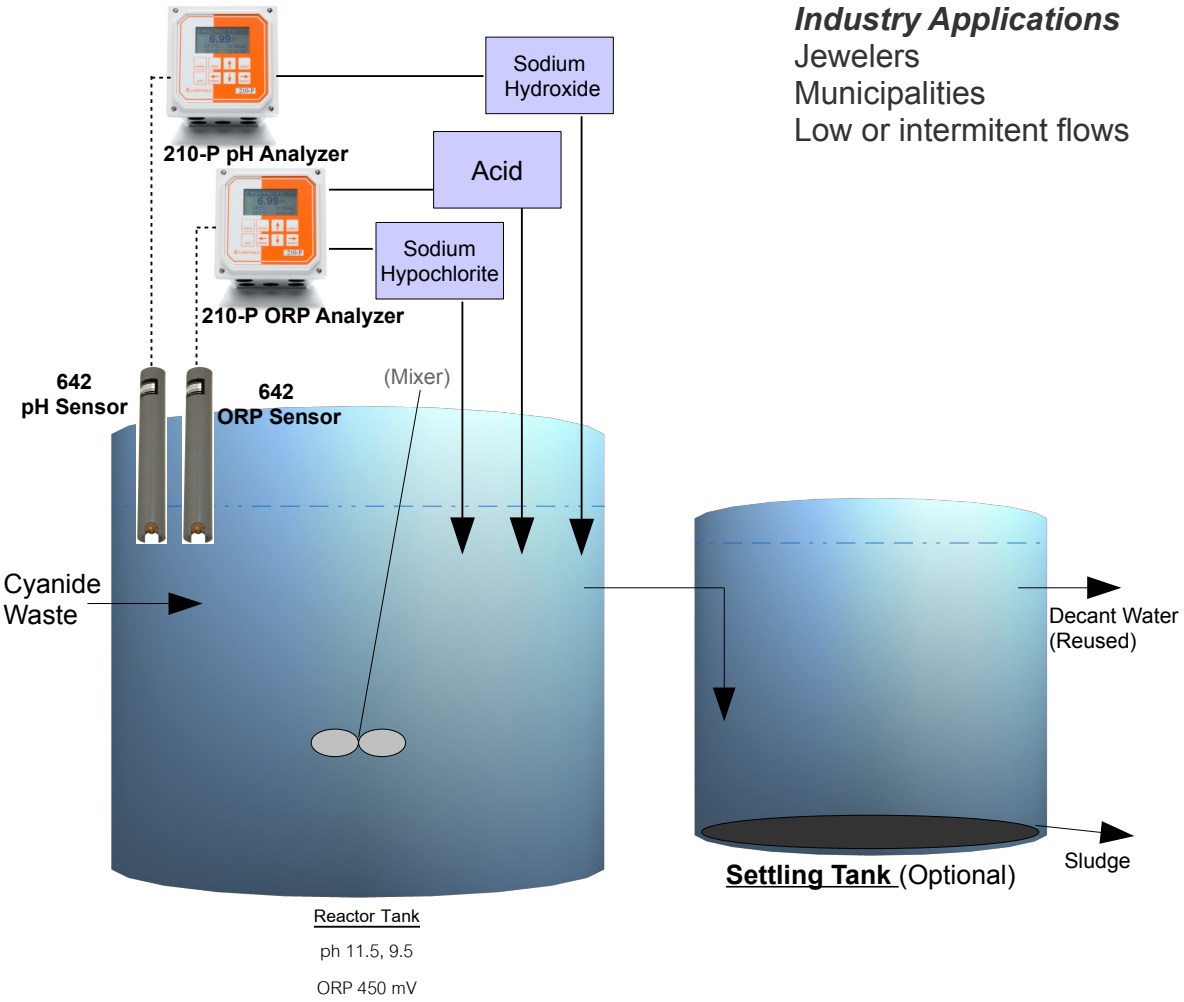
Single Tank Timed Batch Controls



Industry Applications
Jewelers
Municipalities
Low or intermitent flows

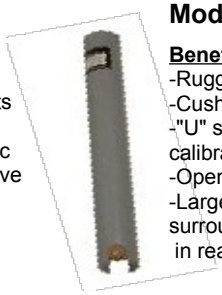
What to Order

pH analyzer, 210-P-8-10-20-92
pH Sensor, 642-34P-72(6M)
ORP analyzer, 210-P(ORP)-8-10-20-92
ORP Sensor, 642-4G-34-72(6M)

Effluent ? pH analyzer, 210-P-8-10-20-92
pH Sensor, 642-34P-72(6M)

Model 210-P: pH/ORP Analyzer

Benefits -Solid metal mine survivor housing
-Display shows pH, temperature, 4 alarms, 2 4-20 mA
-Easy calibration - recognizes your buffers, holds outputs
-Self- and sensor diagnostics
-Programmable 4-20 mA outputs: 1 for acid, 1 for caustic
-Characterizable 4-20 mA easily fits to your reaction curve
-Four programmable alarms with self- and sensor alert
-ON-OFF control and/or pump pacer control
-Optional PID control
-Optional communications



Model 642: Process Combination pH Sensor

Benefits -Big solid 30 cm (1 foot) mine ready survivor
-Rugged body constructed from 2.5 cm (1 inch) schedule 80 pipe
-Cushion-mounted pH electrode resists shocks
-"U" shaped body protects glass tip from breakage during calibration, cleaning and accidental impact.
-Open electrode tip for easy cleaning
-Large 2.5 cm (1 inch) diameter reference junction surrounding pH tip resists plugging and eliminates variations in reading caused by changes in flow direction.

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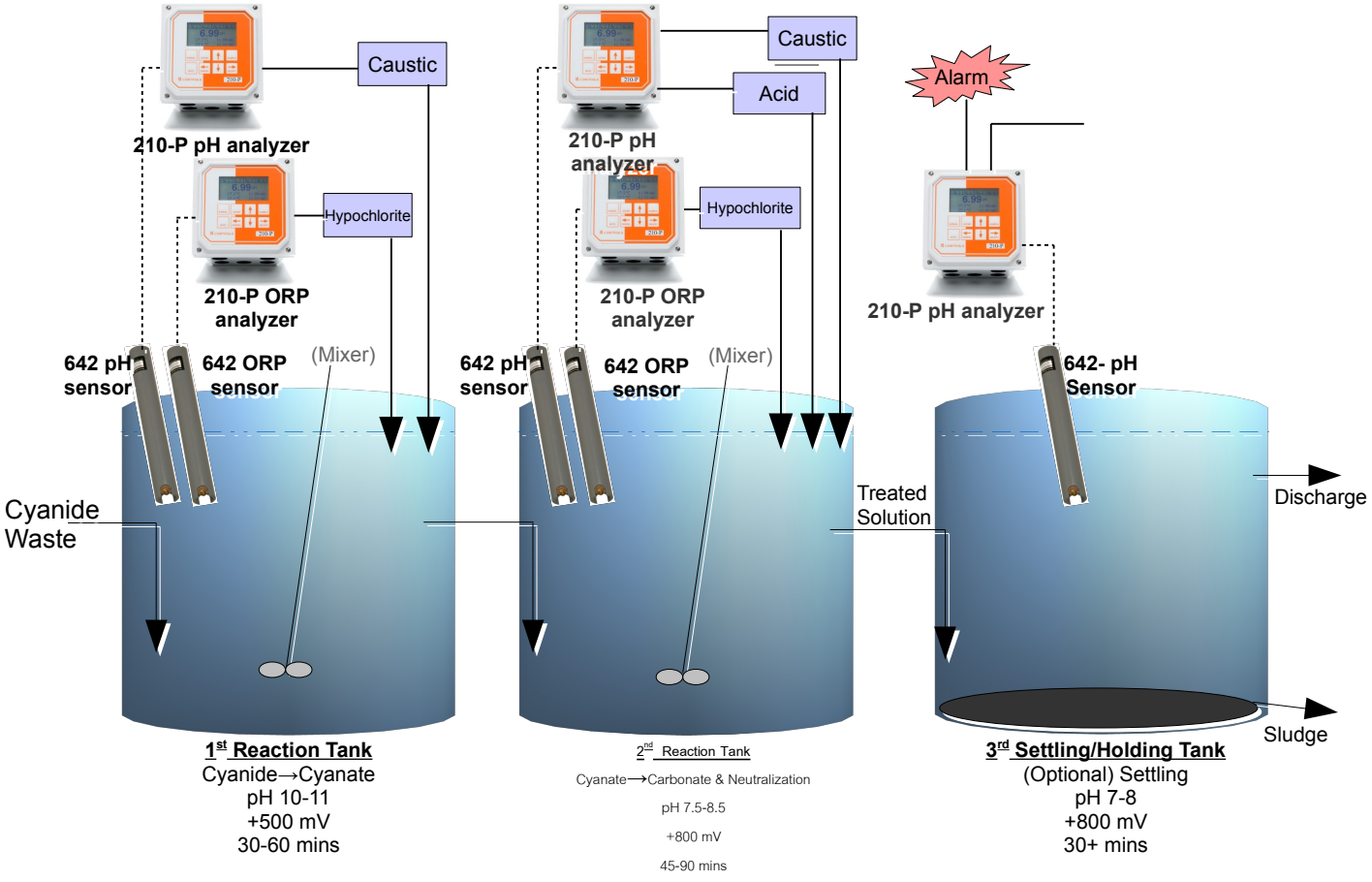
Dual tank 2 step controls Cyanide Waste Treatment



What to Order

3 pH analyzers, 210-P-8-10-20-92
3 pH Electrode, 642-34P-72(6M)
2 ORP Analyzers, 210-P(ORP)-8-10-20-92
2 ORP Electrode, 642-4G-34-72(6M)

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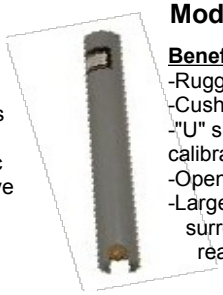

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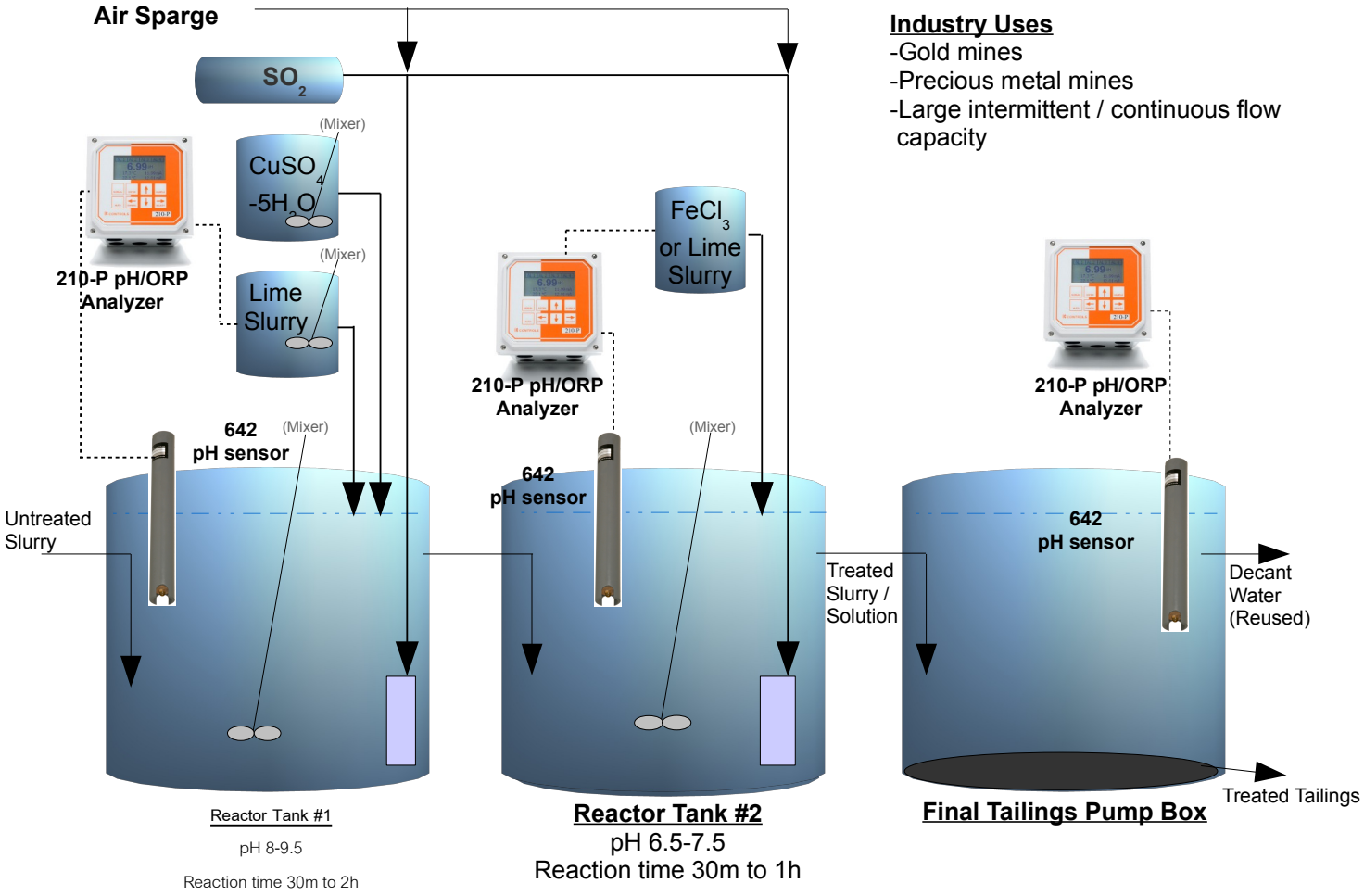
INCO SO_2 / AIR cyanide destruction process



Industry Uses
-Gold mines
-Precious metal mines
-Large intermittent / continuous flow capacity

What to Order

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3 pH Electrode, 642-34P
3 Industrial pH Interface with Preamp, 600-P-72D(10M)

IC Controls Instrumentation

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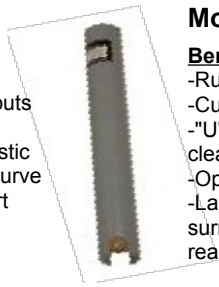

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