detect abnormal conditions and the information gleaned from those systems is of limited practical use.

In the context of corrosion prevention, three of the most useful data sets for a monitor to measure are pH, metal (especially iron) ion concentrations, and chloride ion concentrations. Ideally the monitored data is as close to real time as possible so remediation techniques for the causes of extreme concentrations can be applied before the causes effect corrosion or otherwise damage the facility. Unfortunately current monitoring technologies provide a large volume of false data so real time monitoring is usually difficult if not impossible. Moreover the false data can lead to the wasting of expensive remedial chemistries when their addition was not needed. As a result a truly automated remedial chemical feed system is not feasible and a human operator is typically required to prevent the addition of remediating chemicals in the face of a “false alarm” thereby increasing operation costs.

Thus there is a clear need for and utility in an improved method of monitoring the conditions within a chemical plant. The art described in this section is not intended to constitute an admission that any patent, publication or other information referred to herein is "prior art" with respect to this invention, unless specifically designated as such. In addition, this section should not be construed to mean that a search has been made or that no other pertinent information as defined in 37 C.F.R. § 1.56(a) exists.

**Brief Summary of the Invention**

In one aspect, there is provided a method of correcting an error in raw

measurements of a process variable taken from at least one sensor in a chemical process system characterized by properties which cause the measurements to be erroneous, the method comprising the steps of: using the at least one sensor to obtain the raw measurements of the process variable, wherein the raw measurements have an error comprising a static error component that causes a fixed change in the raw measurement and a dynamic error component that causes dynamic state changes in the raw measurement over time; identifying the dynamic error component, wherein identifying the dynamic error component comprises providing an association between the dynamic state changes measured by the at least one sensor and a disturbance; identifying the static error component; and using the identified static error component and the identified dynamic error component to alter the raw measurements to provide corrected measurements.

At least one embodiment of the invention is directed towards a method of

**Claims**

What is claimed is:

1. A method of correcting an error in raw measurements of a process variable taken from at least one sensor in a chemical process system characterized by properties which cause the measurements to be erroneous, the method comprising the steps of:

using the at least one sensor to obtain the raw measurements of the process variable, wherein the raw measurements have an error comprising a static error component that causes a fixed change in the raw measurement and a dynamic error component that causes dynamic state changes in the raw measurement over time;

identifying the dynamic error component, wherein identifying the dynamic error component comprises providing an association between the dynamic state changes measured by the at least one sensor and a disturbance;

identifying the static error component; and

using the identified static error component and the identified dynamic error component to alter the raw measurements to provide corrected measurements.

2. The method of claim 1 in which the at least one sensor is in informational communication with an analyzer and the analyzer is in informational communication with a controller, the at least one sensor constructed and arranged to obtain the raw measurements of the process variable, the analyzer correcting the raw measurements to provide the corrected measurements, the controller taking the corrected

measurements and if the corrected measurements indicate that the process variable is outside of a pre-determined range of acceptable values, enacting a remedial measure to change the process variable to a value within the range of acceptable values.

3. The method of claim 2 in which the remedial measure is enacted before a steady state value of the process variable is detected by the at least one sensor.

4. The method of claim 1 in which the process variable is selected from a list consisting of: oxidation-reduction potential, pH, a level of a chemical, a level of an ion, temperature, pressure, process stream flow rate, dissolved solids and suspended solids.

5. The method of claim 2 in which there are at least three sensors, wherein each of the three sensors passes on raw measurements to the analyzer, the analyzer using an average of those raw measurements to obtain a corrected measurement if at least one of the raw measurements used to obtain said average of those raw measurements fits within a pre-determined setpoint expected for the specific conditions under which said raw measurements used to obtain said average of those raw measurements were taken, or alternatively the analyzer uses a historically expected measurement to obtain a corrected measurements if none of the raw measurements used to obtain said average of those raw measurements fits within a pre-determined setpoint expected for the specific conditions under which said raw measurements used to obtain said average of those raw measurements were taken.

6. The method of claim 2 in which the process variable is iron concentration, the method further comprising the steps of: using the at least one sensor to obtain raw measurements of the iron concentration over time, disregarding a raw measurement that indicates zero iron concentration, and providing an adjusted raw measurement to the analyzer using regression analysis on the raw measurements.

7. The method of claim 2 in which the remedial measure involves adding a chemical whose effect on the process variable is non-linear in nature, the analyzer correcting for the non-linear effect of the remedial chemical correcting the raw measurements to provide the corrected measurements.

8. The method of claim 2 in which the remedial measure involves adding a chemical subject to a deadtime constraint and the analyzer uses the deadtime constraint to provide a corrected measurement.

9. The method of claim 2 in which the process system is a system selected from a chemical plant, a refinery, an oil refinery, a food processing facility, a manufacturing plant, a distillation column, a water filtration plant, a factory, a waste processing facility, a water treatment facility, and any combination thereof.

10. The method of claim 2 in which:

the analyzer predicts a corrosion rate that will result from the formation of salt compounds, the method utilizing inputs from at least one of each of a pH sensor,

Chloride sensor, Fe sensor. Nitrogen sensor, total nitrogen sensor, ammonia sensor, total amine sensor, and an electrical resistance corrosion probe; and

in response the controller feeds into the system an appropriate amount of at least one of: Water, Sodium Hydroxide, potassium hydroxide, lithium hydroxide, methylamine, dimethylamine, trimethylamine, ethylamine , diethylamine, triethylamine, n-propylamine, isopropylamine, di-n-propylamine, di-isopropylamine, n-butylamine, sec-butylamine, 1- amino-2,2-dimethylpropane, 2-amino-2-methylbutane, 2-aminopentane, 3-aminopentane, morpholine, monoethanolamine, ethylenediamine, propylenediamine, N,N-dimethylethanolamine, N,-N-diethylethanolamine, N,N-dimethylisopropanolamine, Methoxyethylamine, Piperidine, Piperazine, Cyclohexylamine, N-methylethanolamine, N-propylethanolamine, N-ethylethanolamine, N,N-dimethylaminoethoxyethanol, diethylaminoethoxyethanol, N-methyldiethanolamine, N-propyldiethanolamine, N-ethyldiethanolamine, t-butylethanolamine, t-butyldiethanolamine, 2-(2-aminoethoxy)ethanol di-n-butylamine, tri-n-butylamine, di-iso-butylamine, ethyl-n-butylamine, pentylamine, 2-amino-2,3-dimethylbutane, 3-amino-2,2-dimethylbutane, 2-amino-1-methoxypropane, dipropylamine, monoamylamine, n-butylamine, isobutylamine, 3-amino-1-methoxypropane and any combination thereof.

11. The method of claim 2, wherein the chemical process system is a crude unit and the process variable is chloride ion concentration and said method further comprising the steps of:

(a) introducing an opportunity crude oil into the crude unit that previously contained a different kind of crude oil, the properties of the opportunity crude differing from the previous crude oil such that the introduction of the opportunity crude disrupts a steady state of the crude unit including causing a corrosion inducing spike in chloride concentration;

(b) using the sensor to measure the chloride ion concentration;

(c) using the measured chloride ion concentration to obtain a corrected chloride ion concentration; and

(d) if the corrected chloride ion concentration has an error with respect to a setpoint, causing a change in an influx of a composition into the process stream, the composition capable of adjusting the chloride ion concentration.