Reference case study RCS/SAPPI/001–EN

SAPPI Nijmegen
Redox and conductivity sensors

Measurement made easy

Improved housekeeping and process optimisation with redox and conductivity electrodes

How it all began...

Year 2005 / 2006:
All broke tanks had become acid with negative effects on:
— Strength properties
— Dewatering

No broke quality tool available for operator:
— No housekeeping

SAPPI asked itself the following questions:
1. How can we determine the quality of a broke tank?
2. Which measuring principles gives the operator the right tools?

Knowing the effects in practice, SAPPI checked three measurements to improve the housekeeping of the broke: pH, Redox and Conductivity

pH
We did not see any reason to measure pH

Redox
Redox is an early indicator to show microbiological activities
At –500mV Redox, the operator assumes that the broke is too acidified to use.
But Redox only is certainly not enough to take conclusions on the quality…..

Conductivity
When there was more free calcium in de tank, the conductivity raised
It was known that problems occurred at the wet-end, when the conductivity was above 1900 µS/cm. This caused sudden runability problems.

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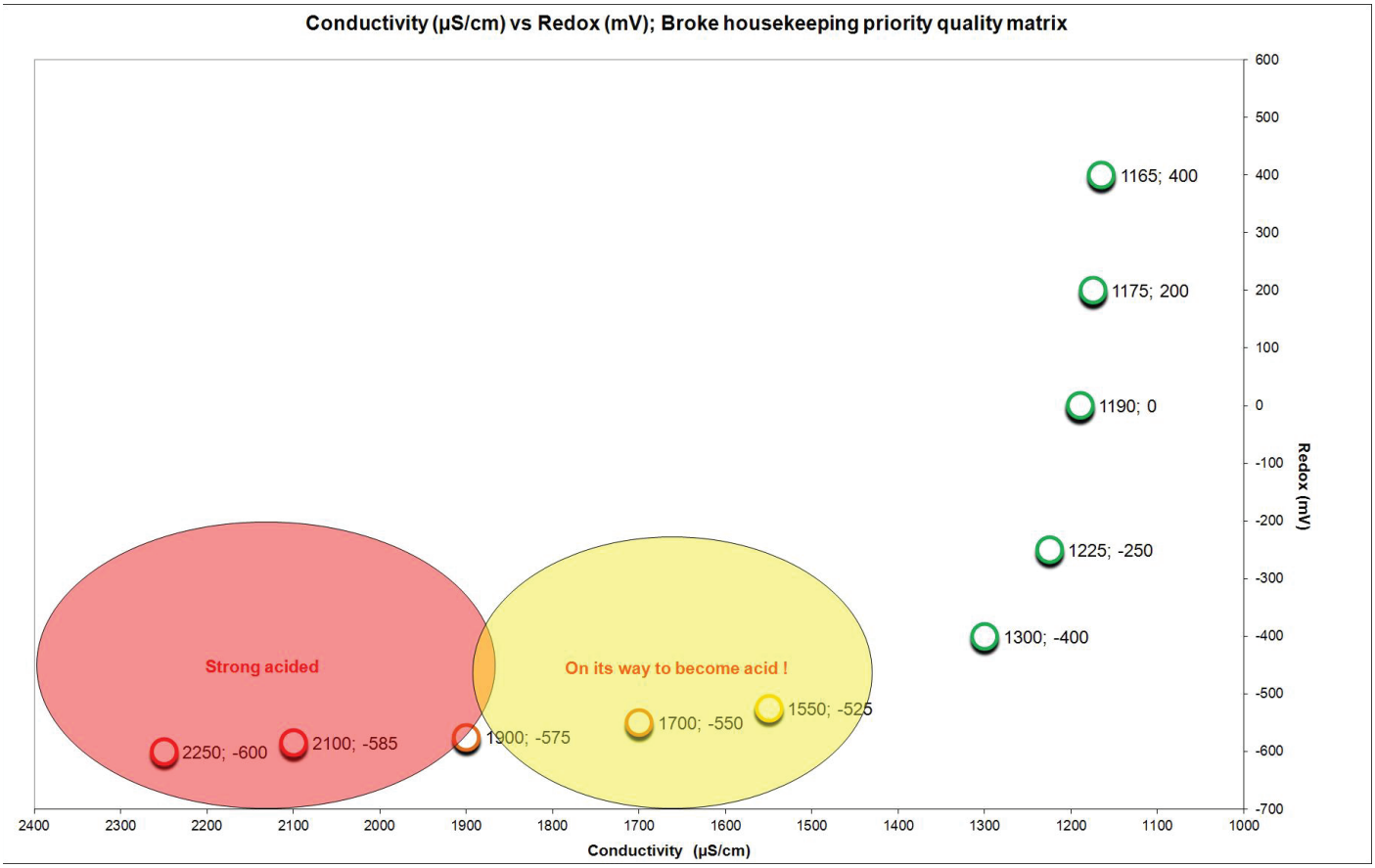

The expectations and results

Which advantages have been achieved by Redox and Conductivity?

Important housekeeping tool for the operator
Sensor: Conductivity and Redox
- Better broke housekeeping.
- Which broke is most acid at this moment? Which tank are we going to empty now?
- Combined Redox, Conductivity measurement is an important indicator for the broke quality state.

Headbox; an effective monitoring tool
Sensor: Conductivity and Redox
- Effect broke quality and housekeeping
- Process instability control

Reduced chemical usage and quality improvement
Sensor: Conductivity and Redox
- Reduction of broke treatment chemicals (microbiological treatment)
- Reduction of ATC possible by broke control and broke housekeeping
- Corrections with regards to the base- and rawmaterials become visible, especially with the Redox measurement
- Broke quality improvement by monitoring microbiological treatment
- Improvement paper strength stability

Reduction of dissolved load to the waste water treatment plant
Sensor: Conductivity
- Sewer
- Wetend drain process water

Stirring with minimum energy consumption
Sensor: Conductivity
Case: Instable conductivity was affected by intruded air from the stirring system
— Frequency converters on the stirring motors installed
— Stirring speed depends on broke tank level
— Stable conductivity
— Lower energy consumption
Case: The broke went down in layers. This effect is visible when the Redox value changes suddenly

Sensor: Redox
— The tank did not get stirred well enough
— Gear box stirrer have been changed
— Stable Redox

The Legionella treatment effectiveness can be monitored
Sensor: Redox
— A Redox electrode must kept wet at all times. That's why we flush the electrodes with process water
— Sappi measured values of 700 mV
— Due to this monitoring, a new project was started to improve the Legionella treatment

Trouble shooting tool
Sensor: Redox (online and lab)
Case: The mill did not produce for a month due to a fire
— Redox showed that something was wrong with the broke system and raw materials
— Redox indicaded a quick degradation
— (Lab)-Redox was a good indicator which showed that coating components and the broke system gave the main problem

Control tool for boil out effectiveness
Sensor: Conductivity
— Time
— Concentration
— Temperature

Is it all that simple?

No!, for sure!!
Rule Nr. 1: Act on your own judgment with regards to the read values
Example: Redox is influenced by process circumstances
It could be influenced by intruded air but also peroxide / oxidants via cellulose
Too high consistency values are visible with Redox and Conductivity
New broke will not mix well due to the high consistency
Result: an accelerated process of rotting
This will not be visible by Redox when the broke treatment has started
Pump switched on and no reaction = poor mixing of broke = too high consistency
On the other hand: when broke is already acidified (or the stirrer turns too quick) and it is treated, it will show an increasing Redox value
So, think over very well what could influence the different values
At Sappi Nijmegen the Redox and Conductivity measurements turned out to be very successful!

And what about maintenance?

Almost none!

Sensor: Redox
Replacement:
— Once per 2,5 year
— Rest capacity level ±70%
— Once per year all sensors are being checked with laboratory measurements

Sensor: Conductivity
— The sensors are easy to check by laboratory equipment
— No visible drift in 2,5 years

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