

Zero pollution with the help of bacteria

Oxygen, pH and ORP in the effluent treatment of a coking plant

Industry: Steel production

Application: Effluent treatment of a coking plant

Hamilton product: VisiFerm DO Arc, Polilyte Plus Arc, Polilyte Plus ORP Arc

Only decades ago the smog around steel and coking plants was sometimes so heavy that one could hardly see them. Rivers smelled badly because of the pollutants and the fish died. Sophisticated gas filter systems and effective water treatment plants changed the situation and nowadays one can see anglers again just down the river of a steel and coking plant.

ArcelorMittal in Ostrava is the biggest coke manufacturer in the Czech Republic and produces more than 1.5 Mio tons of coke per year. Thereby a considerable amount of waste water is being formed. The polluted water contains tar, oil, other organic materials and suspended particles. This is cleaned by one of the most sophisticated water treatment plants in the European industry. Approximately 90% of the COD load (chemical oxygen demand) and 75% of the nitrogen load are removed. Thus all of the remaining sludge and all the water can be recycled inside the coking plant.

In a first step of the cleaning process, the solids and the organic phase are mechanically removed. The waste water is then biologically processed in four basins, one after another. This is



Fig. 2: VisiFerm DO Arc and Polilyte Plus ORP Arc sensors in a housing.

done biologically by means of different bacteria, such as Pseudomonas, Thiobacillus, Nitrosomonas and Nitrobacter. The different stages lead to the biodegradation of phenol, thiocyanates, cyanides, thiosulphates, polythionates and ammonia.

To receive the high yields of decomposition it is important to control precisely the determining parameters for the bacteria involved - oxygen, pH and oxidation reduction potential (ORP). At this point Hamilton sensors come into the game to allow for optimum conditions. ArcelorMittal uses one sensor each in all four basins.

The optical dissolved oxygen sensor VisiFerm DO Arc provides stable and reliable measuring values in the dirty effluent and



Pseudomonas



Pseudomonas



Thiobacillus



Thiobacillus



Nitrosomonas



Nitrobacter

Figure 1: Cascade of decomposition of the pollutants phenols, nitrates, thiosulfates, thiocyanates and ammonia by means of various bacteria families.

is not prone to contamination. It does not show any interference with CO₂ or SO₂ either. No calibration is needed, even after months. Mechanical cleaning with water every week is sufficient. Further maintenance like changing membranes or refilling the electrolyte as with Clark-type sensors is not necessary. The life time of the sensor cap is longer than two years now and counting. No external transmitter is needed due to the micro transmitter integrated in the sensor head.

The Polilyte Plus Arc and the Polilyte Plus ORP Arc are equipped with micro transmitters as well, giving the same benefits. Like the VisiFerm DO, these sensors are cleaned weekly, too. In spite of the demanding conditions in the effluent treatment plant, the sensors only need to be calibrated once every few months. The Arc system provides the possibility to perform the calibration off-line in the lab at defined conditions, since the calibration data are stored in the micro transmitter. The life time of the sensor is considerably higher than with sensors of other brands – approximately 18 months for the Polilyte Plus Arc and 2 years for the Polilyte Plus ORP Arc and counting.

Acknowledgements

We would like to thank Mr. Jaroslav Grygar of ArcelorMittal for showing us the effluent treatment plant of the cokery of ArcelorMittal in Ostrava and supporting us with this application note.

Features of Arc

- ▶ Robust signals
- ▶ Direct connection to PCS through 4-20 mA and digital signal
- ▶ Modbus communication by open standard
- ▶ All relevant sensor data stored in the sensor head
- ▶ Sensor diagnostics
- ▶ Wireless communication, calibration and configuration via a wireless adapter with the Arc View Handheld

Benefits of VisiFerm DO Arc, Polilyte Plus Arc and Polilyte Plus ORP Arc

- ▶ Stable and reliable readings
- ▶ Long sensor life time
- ▶ Easy maintenance
- ▶ Smart solution



Fig. 3: Basin of the effluent treatment plant.

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P/N: 691139/00 — 1/2014

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