

Suspended solids in scrubber of fertilizer production

Borealis lab test of light-absorption sensor Turbimax CUS50D



Keep Discovering

Rosier Nederland in the Netherlands is part of the chemical division of the Borealis group. Rosier helps to improve agricultural yields all over the world by producing fertilizers (N, P, K, S). During the production of these fertilizers, several gasses release that contain both harmful substances and solids that have to be washed out.

"A too high concentration of suspended solids in the venturi scrubber will cause problems, such as blocked spray nozzles and efficiency dropdown. Two main challenges to overcome during the measurement of the solids concentration are the high process temperatures (max. 60 °C) in combination with the 20-50 g/L chloride concentration. The Turbimax CUS50D appears to be the solution to our problem. Also because of the pleasant cooperation between Endress+Hauser and Rosier Nederland, combined with the mutual interest, this project turned out to be a success."

Lars Peeman
Graduate Process Engineering
Rosier Nederland, Sas van Gent,
The Netherlands



Lars Peeman
Graduate Process Engineering

In the venturi scrubber, scrubber water absorbs substances such as gypsum, ammonia and solids/dust that release during the production process. But, if not managed correctly, a high suspended solids concentration would cause frequent maintenance of the installation or even unexpected downtime.

Customer challenge An inline concentration measurement will improve the production process and minimize downtime of the installation. It would be ideal to prevent the suspended solids concentration from becoming too high. But, conventional suspended solids sensors based on the NIR light reflection turbidity principle do not correlate sufficiently if different liquids are used. Furthermore, due to the high chlorides concentration, stainless steel sensors cannot be used



Gasscrubber at Rosier Sas van Gent-site

because of corrosion. Also, commonly available plastic turbidity sensors are not resistant to the high temperatures of maximum 60 °C. An additional phenomenon which could cause problems in this process is fouling of the sensors' optics, despite the very smooth sensor surface. This needed to be taken into account beforehand.



Turbimax CUS50D sensor

Our solution

The Turbimax CUS50D is the newest suspended solids concentration sensor. Its measuring principle applies a simplified version of Lambert-Beer's law:

$$A = \epsilon \cdot l \cdot c$$

A = absorption of NIR light (in AU; absorption units)
 ϵ = extinction coefficient
 l = distance of light passing through the liquid (in cm)
 c = concentration of the component to be determined

Since both ϵ and l are constant in this application, the only variable in the equation is the concentration of the component to be determined. Thus, in this case the suspended solids concentration.

The final solution includes:

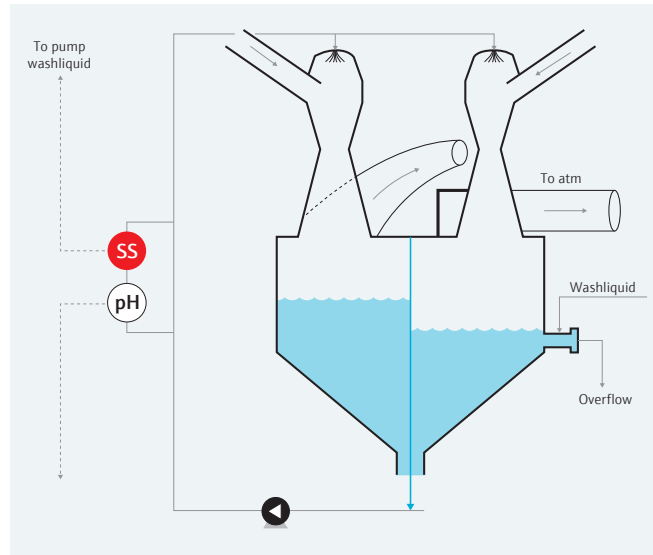
- Turbimax CUS50D light absorption sensor. This sensor has only highgrade plastics as so-called 'wetted parts' (no glass and/or metals)
- Liquiline CM442 transmitter
- Modified Flowfit CPA240 flow assembly made from PVDF + nozzle for air cleaning

Because of the expected fouling on the sensor optics, a special flow assembly is designed which included a spray nozzle. Through this spray nozzle, compressed air will flush periodically against the sensor head to prevent the solids from

depositing on the sensor optics. Thus, the measurement will remain accurate without the need for frequent manual labour.

The results

- Accurate & repeatable measurement of the suspended solids concentration in the complete range of 15-80 g/L
- Suitable for different wash liquids without recalibration
- Measurement independent of dissolved solids
- Suitable for high temperatures, high chloride concentrations and low pH values



Process layout venturi scrubber + Turbimax CUS50D sensor (on the left)

Nederland

Endress+Hauser BV
Nikkelstraat 6
1411 AJ Naarden
Postbus 5102
1410 AC Naarden
Tel. +31 35 695 86 11
Fax +31 35 695 88 25
info@nl.endress.com
www.nl.endress.com

CS01571C/15/EN/01.18