

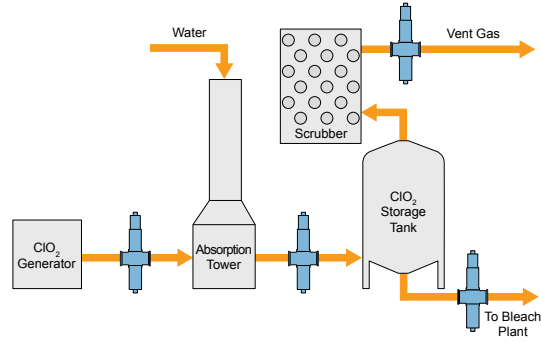
TOP 5
Pulp and Paper
Applications



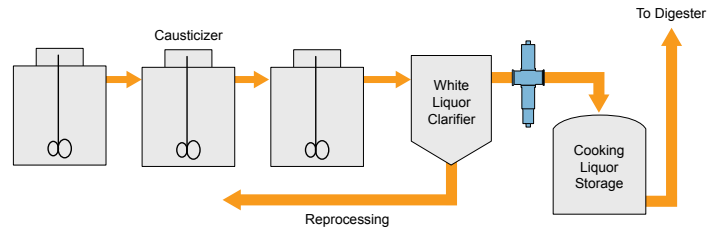
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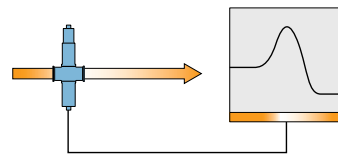
TOP 1 Inline ClO2 Monitoring



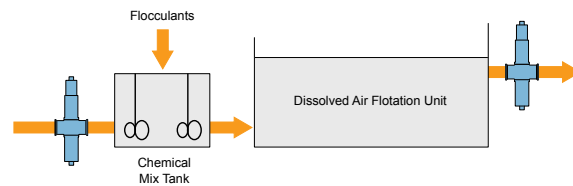
TOP 2 White Liquor Filtration



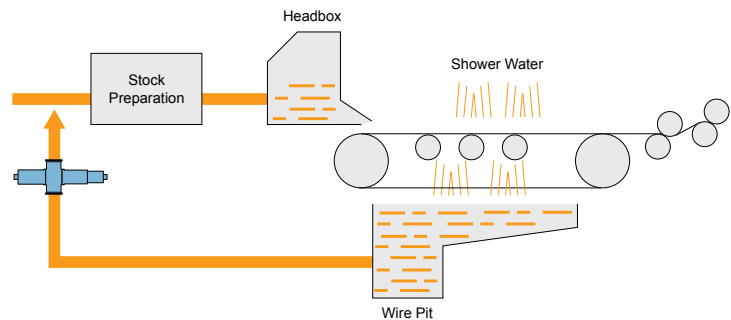
TOP 3 Raw Water Quality



TOP 4 Effluent Water Monitoring



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In many stages of pulp & paper processes, optek photometers help to ensure optimum system performance.

optek is the world's leading manufacturer of inline photometric process instrumentation. With more than 30,000 installations in various applications and industries, our team provides the best in quality, consulting, support and long term performance, worldwide.

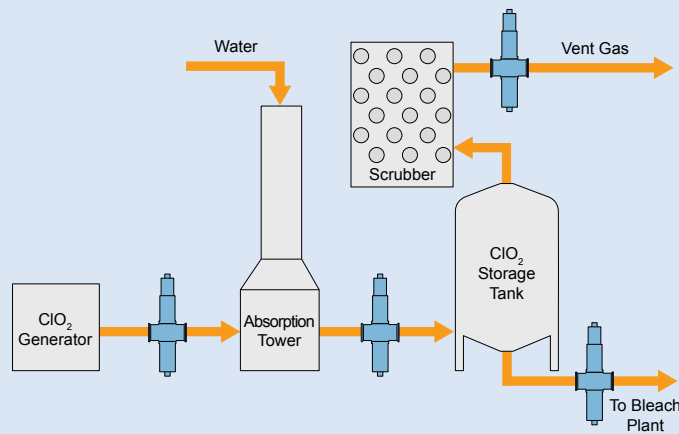
High quality materials are able to withstand the toughest process conditions, including high temperature and high pressure applications. Cleanability is ensured using high quality wetted materials, superior design and sapphire optical windows.

As a global partner to the pulp & paper industry, optek offers the most advanced technologies such as superior signal amplification, inline calibration support, PROFIBUS[®] PA, and multilingual user interfaces for easy onsite operations. Our support ensures long term satisfaction with programs like "SpeedParts" and "SwapRepair" to provide our customers sustainable operations and minimal downtime at the lowest cost of ownership.

Optimize your process with optek.



04 | Inline ClO₂ Monitoring



Inline ClO₂ Monitoring

Chlorine dioxide (ClO₂) has become the most significant bleaching agent in the pulp and paper industry for Elemental Chlorine-Free (ECF) bleaching. Different bleaching sequences must be used in the production of various pulps. This depends on the pulping process used, the residual lignin content of the pulp, and the target brightness. Key goals at most pulp mills include the optimization of reaction efficiency of ClO₂ generators, the proper dosage of ClO₂, and improving the control of vent-gas scrubbers to reduce chlorine dioxide emissions into the atmosphere.

Chlorine dioxide gas is commercially generated either by reduction of sodium chlorate in an acidic medium or oxidation of sodium chlorite. It is a synthetic yellowish-green, explosive gas, which is stable as an aqueous solution only if the solution is protected from light and kept refrigerated. For this reason, chlorine dioxide must be produced and consumed onsite by means of a chlorine dioxide generator. The efficiency of these generators and the dosage of chlorine dioxide can be optimized using optek inline ClO₂ analyzers.

Due to the very aggressive nature of the process stream, all wetted parts are manufactured from corrosion resistant materials, such as titanium and sapphire. Integrated dual-channel reference detectors compensate for all possible disturbances such as varying levels of particulates (turbidity) and lamp aging. Special NIST-traceable reference filters allow users to verify analyzer performance without any process intrusion, making validation quick, simple and safe.

Installation

optek sensors are easily installed to provide real-time measurements that optimize process performance. The modular optical design ensures optimal installation and high resolution measurements.



optek AF26 Dual Channel Absorption Sensor

Benefits

optek provides inline, real-time analyzers designed for large industrial pipelines. These sensors are installed using flow through sensor bodies that withstand high pressure installations. Sample taking off the process stream and laboratory analysis are no longer needed due to the online concentration measurement directly in the pipeline.

Inline ClO₂ concentration measurements are achievable in liquid and gas streams. Split-beam technology compensates for lamp aging and varying particulate levels. optek inline sensors are also available with hazardous area classifications (ATEX, FM).

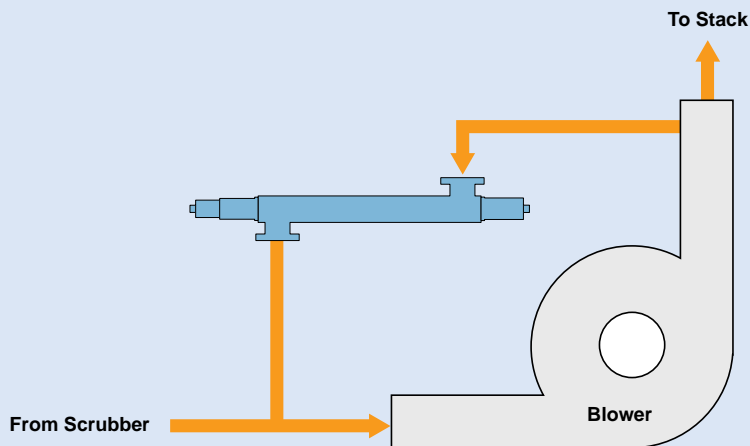
optek dual channel sensors compensate for background turbidity or other media constituents automatically using a secondary wavelength. The signals from other instruments measuring temperature or pressure are recommended to be used directly as compensation for the raw gaseous ClO₂ concentration.

Sapphire optics provide superior resistance to all abrasive and corrosive media to ensure long term installations. To reduce installation costs in multiple point applications, the microprocessor based converter with four 4-20 mA outputs is capable of interfacing with two separate inline sensors. The signals of the converter can optionally be transferred to a PLC or plant DCS using the PROFIBUS[®] PA communication.



optek C4000 Photometric Converter

06 | Inline ClO₂ Monitoring



ClO₂ Solution Strength

In chlorine dioxide generation, gaseous chlorine dioxide is transferred to the absorption tower and dissolved in chilled water to yield the strong aqueous chlorine dioxide bleach solution. This solution is then pumped to storage tanks for further use in the pulp bleaching process. To ensure optimum control of the ClO₂ bleach solution strength, ClO₂ concentration is measured before and after the storage tanks using an optek AF26 dual channel absorption sensor.

ClO₂ Generator Gas Concentration

In addition to the ClO₂ concentration measurements, using an AF26 sensor to measure the ClO₂ generator gas concentration at the inlet of the absorption tower, helps optimize the ClO₂ generation process.

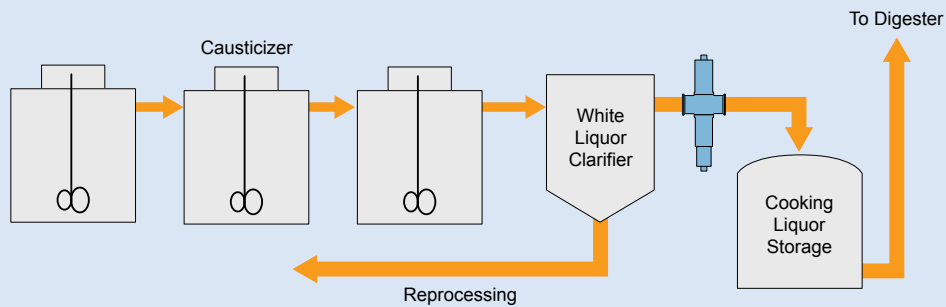
Tail Gas

Vent gases are combined and sent to a wet gas scrubber, where white liquor or weak wash is used as a reducing agent. The scrubbed vent gases are then transferred to the stack for discharge. For environmental control, residual chlorine dioxide measurements in the vapor phase are employed to reduce chlorine dioxide emissions and control vent-gas scrubbers. Installing an optek AF26 inline chlorine dioxide sensor in a side loop off the stack allows for real-time chlorine dioxide concentration measurements.

This provides plant personnel an immediate indication of a scrubber malfunction, along with ensuring environmental compliance and helping operators optimize the dosage of white liquor or weak wash into the scrubber.



optek AF26-EX-HT Dual Channel Absorption Sensor



Filtration

In the causticizing process white liquor is filtered and clarified to remove particulates and lime mud. These can create long term scaling problems at the digester and downstream problems due to contaminations. Installing a turbidity sensor after the white liquor clarification process allows immediate detection of high solids levels in the white liquor. These high solids levels can be a result of either a filter break or poor settling in the clarifier. Once detected, the process can be diverted for rework and/or further filtration. Not monitoring these high solids in white liquor will cause calcium scaling problems at the digester and upset the complete system.

Measurement Range

Proper clarity of white liquor prior to storage can be verified by using an optek TF16-N scattered light sensor with sapphire optics that are resistant to hot caustic process solution. Maximum measuring range is 0 to 500 ppm for this application and the optimal used range is 0 to 100 ppm with a normal lime mud content of less than 20 ppm.

Benefits

Achieving high quality white liquor and increasing digester performance leads to reduction of product losses and lime build-up downstream. This, in turn, reduces overall maintenance costs in chemical recovery.

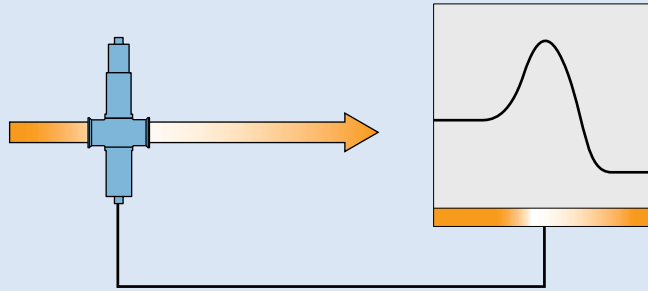


optek TF16-N Scattered Light Dual Channel Turbidity Sensor



optek C4000 Photometric Converter

08 | Raw Water Quality



Raw Water Treatment

Pulp and paper mills need large amounts of water for nearly all stages of production such as the cooking and bleaching of pulp, as well as the preparation of the stock prior to the paper machine. Raw water is usually taken from lakes or rivers. Especially in spring and fall, higher organic loads are present in these waters, causing a slight yellowness. This color has to be removed before the water can be used in the plant.

The decolorization of raw water can be realized by different methods, such as addition of alums or adsorption by active carbon. To optimize the performance of water preparation plants, the degree of yellowness should be monitored using optek colorimeters. optek AF26 inline sensors fulfill this task continuously and reliably. With this information, the dosage of the right amount of decolorization agent can be controlled and optimized.

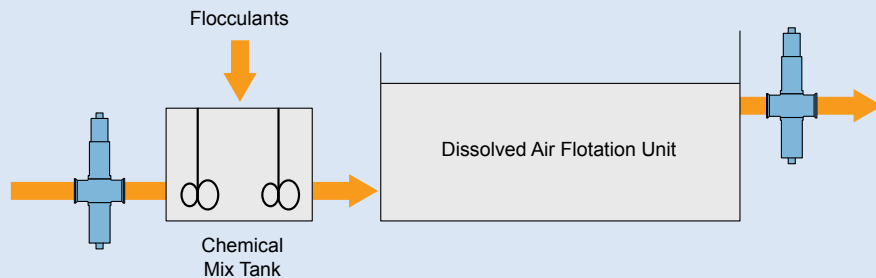
Benefits

optek dual channel sensors ensure that color measurements are independent from varying particulate levels or background turbidity. The first wavelength detects color, whereas the secondary wavelength compensates for background influences.

The optek C4000 converter is capable of reporting different color scales. Optionally, a secondary sensor measuring turbidity may be connected to the same converter. This gives two simultaneous measurements with one converter.



optek AF26 Dual Channel Absorption Sensor



Color Removal

In order to meet environmental discharge requirements, it becomes necessary to measure the mill's effluent and determine the amount of dissolved color. The mill generally treats the problem by using coagulants to precipitate out the color. After this step, it is floated in a DAF (Dissolved Air Flotation) device with the aid of a flocculant.

Using an inline APHA color sensor AF26, expensive sampling and analysis can be avoided. Alarm functions can be used to alert the operator of excessive levels of contaminant before discharge, helping to avoid penalties and fines from local authorities.

Controlling Chemical Feed to DAF

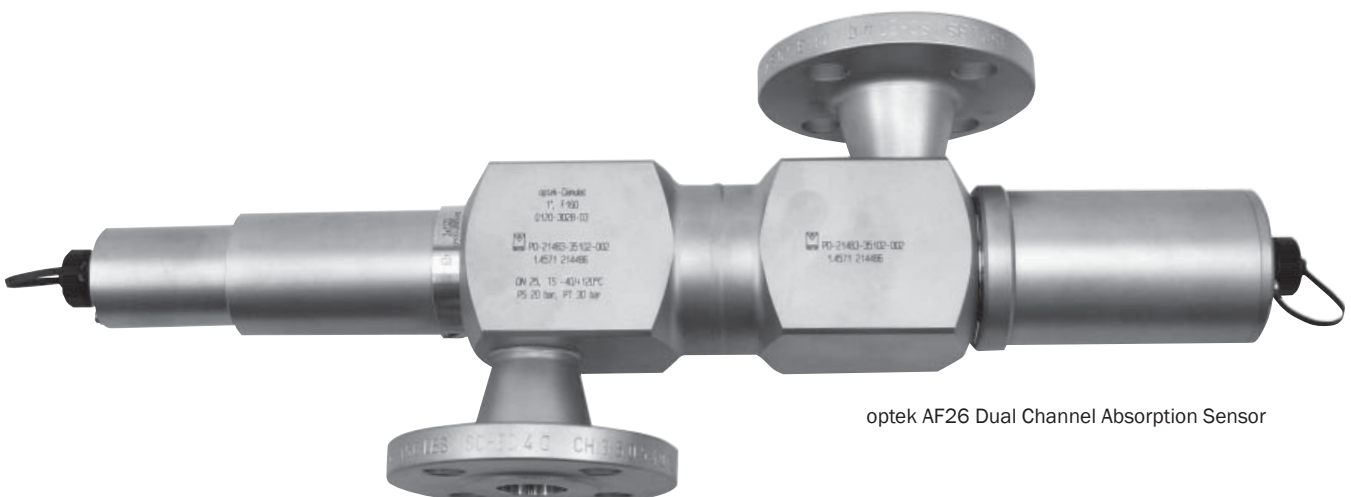
Monitoring and controlling the DAF unit for color helps optimize the addition of chemicals. Basing the chemical dosage on the color measurement rather than a constant feed rate prevents overdosing. An AF26 color sensor installed in the effluent piping from the DAF unit, or even used in conjunction with a second inline sensor in the feed line, provides automated coagulant and flocculant dosing control. In turn, this significantly cuts down the amount of chemicals needed to properly treat the mill's effluent water.

Environmental Effluent Monitoring

As environmental regulations become more strict, the need for paper mills to monitor and report their effluent discharges increases. optek inline sensors not only alert plant personnel when color levels are too high, but also provide continuous data logging. This data can be used to report plant effluent efficiency to governmental regulating agencies.

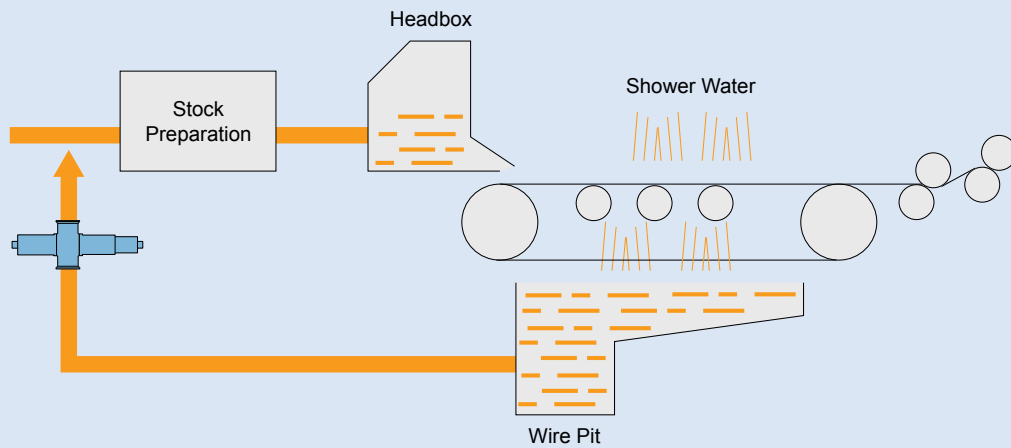
Benefits

Continuous control of water quality and optimum dosage of flocculant are achievable using optek process photometers. Reduction of polymer consumption and effluent costs gives a rapid return on investment. Additionally, unnecessary fines can be avoided while complying with local authorities and regulations.



optek AF26 Dual Channel Absorption Sensor

10 | Turbidity of White Water



White Water Quality

In the sheet-forming step of papermaking, excess water from the dewatering process is called white water. Significant economical and environmental benefits can be realized by optimizing the efficiency of the paper making process.

While the majority of the pulp fibers are retained on the paper machine clothing (wire mesh web) forming the paper web, the remaining pulp stock and water fall through and are collected in the white water tank. Monitoring the concentration of this white water using an optek AF16-N Near-Infrared absorption sensor may provide paper mills real-time information on the efficiency of the mesh web.

Benefits

Waste treatment cost savings are realized by the recovery of usable fiber and fillers normally sent to a landfill or sewer. Also, by controlling particulate levels, energy consumption is reduced.

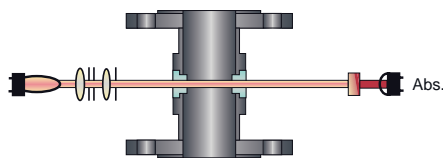


optek AF16 Single Channel Absorption Sensor

11 | Principles of Measurement

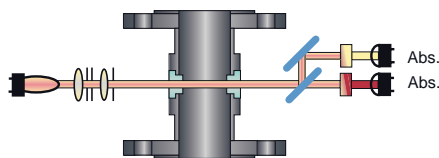
Sensor AF16

VIS- and NIR-Absorption, single channel concentration and color measurement



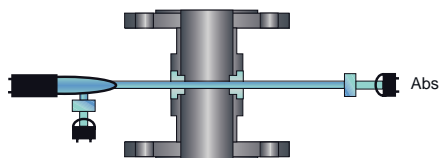
Sensor AF26

VIS-Absorption, dual channel color measurement with turbidity compensation



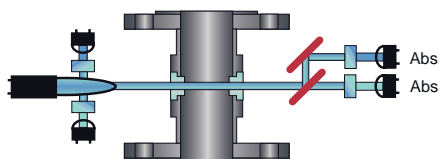
Sensor AF45

UV-Absorption, single channel concentration measurement with compensation of lamp intensity



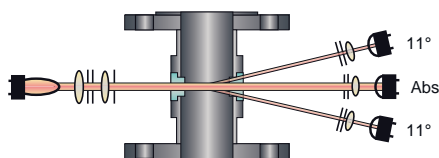
Sensor AF46

UV-Absorption, dual channel concentration measurement with compensation of lamp intensity and background turbidity



Sensor TF16

11° Scattered Light and NIR-Absorption, dual channel turbidity measurement





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