

**TOP 5**

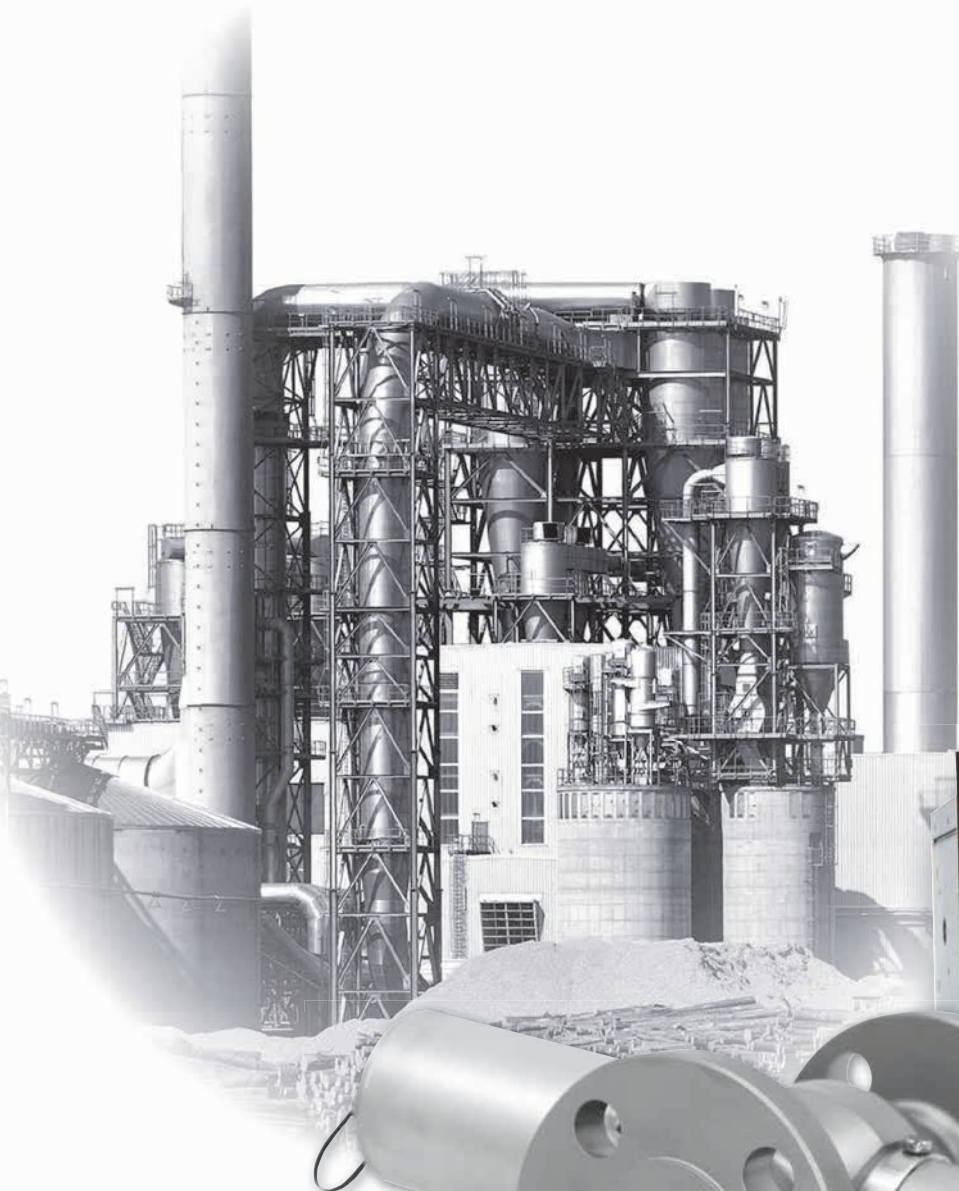
# Pulp and Paper Applications



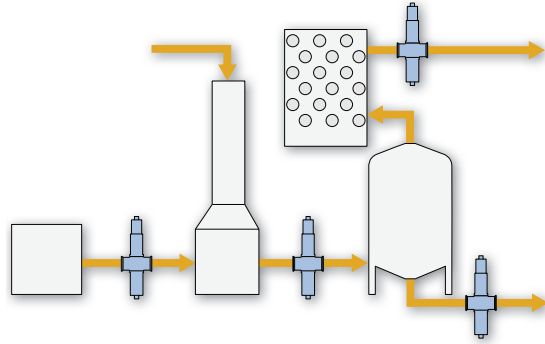
inline control

**english**

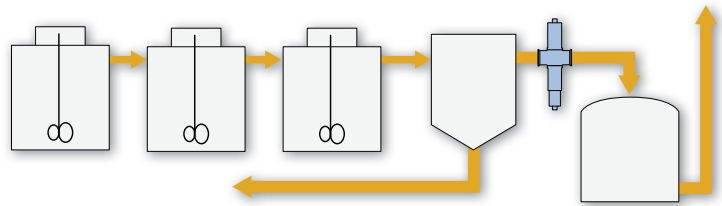
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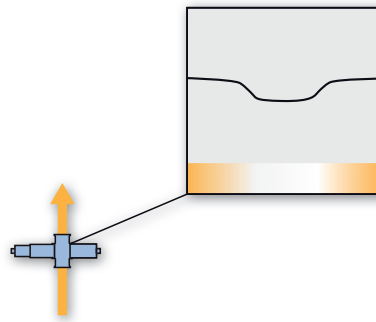
**TOP 1** Inline  $\text{ClO}_2$  Monitoring



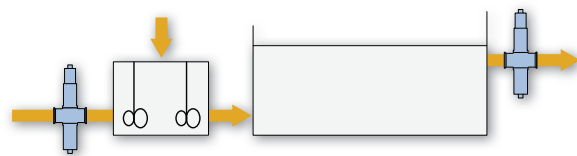
**TOP 2** White Liquor Filtration



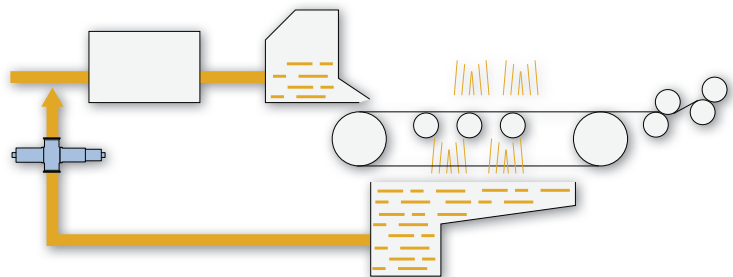
**TOP 3** Raw Water Quality



**TOP 4** Effluent Water Monitoring



**TOP 5** Turbidity of White Water



For over 30 years, optek has focused on measuring process liquids through their interaction with light in facilities all over the world. Although global, optek remains a family owned company with a team of more than 100 qualified, customer-driven professionals.

Our confidence is born from experience. With the expertise of more than 30,000 installations worldwide, our value to the customer resides in providing a superior product that pays back. High quality materials withstand the toughest process conditions including aggressive media, high temperature, and

high pressure applications. Cleanability is ensured using high quality wetted materials, superior design, as well as sapphire optical windows.

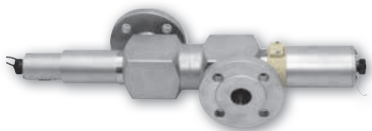
As a global partner to various industries, optek offers the most advanced technologies including superior signal amplification, inline calibration support, PROFIBUS® PA, FOUNDATION™ Fieldbus and multilingual user interfaces for easy onsite operations.

Our support ensures long term satisfaction with programs such as “Speed-Parts” and “SwapRepair” to provide our

customers sustainable operations and minimized downtime at the lowest cost of ownership.

Conformity to international (ISO 9001), industry-specific (FM/ATEX approval) or company standards is easily achieved with optek. Wherever process composition is controlled, the name optek has become synonymous with world-class products and support.

**Optimize your process with optek inline control.**



## Content

### TOP 5 Pulp & Paper Applications

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**See our various product and application brochures for further details**

## 04 | Inline ClO<sub>2</sub> Monitoring



optek C4000 Photometric Converter

### Inline ClO<sub>2</sub> Monitoring

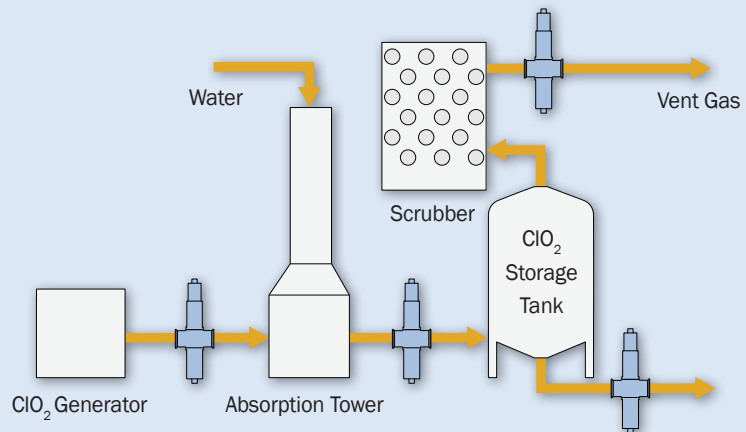
Chlorine dioxide (ClO<sub>2</sub>) has become the most significant bleaching agent in the pulp and paper industry for Elemental Chlorine-Free (ECF) bleaching. Different bleaching sequences must be used in the production of various pulps. This depends on the pulping process used, the residual lignin content of the pulp, and the target brightness. Key goals at most pulp mills include the optimization of reaction efficiency of ClO<sub>2</sub> generators, the proper dosage of ClO<sub>2</sub>, 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 ClO<sub>2</sub> 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.



## Benefits

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

Inline ClO<sub>2</sub> concentration measurements are achievable in liquid and gas streams. Split-beam technology compensates for lamp aging and varying particulate levels including bubbles.

The signals from other instruments measuring temperature and/or pressure are recommended to be used directly as compensation for the raw gaseous ClO<sub>2</sub> concentration. optek inline sensors are also available with hazardous area classifications (ATEX, FM).

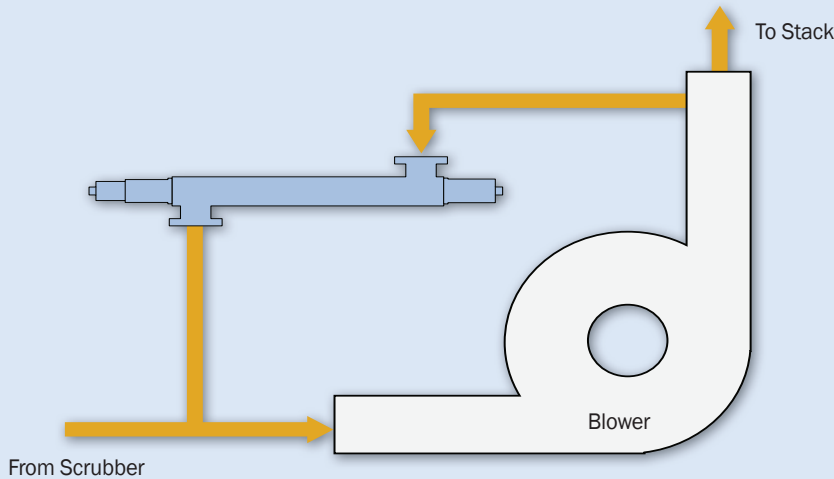
Use of special materials such as titanium and sapphire offer excellent resistance to all abrasive and corrosive media and ensure longevity of the installation. To reduce installation costs in multiple point applications, the microprocessor based C4000 converter with four 4-20 mA outputs is capable of interfacing with two separate inline sensors. The signals of the converter can optionally be transferred to a PLC or plant DCS using the PROFIBUS<sup>®</sup> PA communication or FOUNDATION<sup>™</sup> Fieldbus.



optek AF26-VB Dual Channel Absorption Sensor with Calibration Adapter



## 06 | Inline ClO<sub>2</sub> Monitoring



### ClO<sub>2</sub> 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 ClO<sub>2</sub> bleach solution strength, ClO<sub>2</sub> concentration is measured before and after the storage tanks using an optek AF26 dual channel absorption sensor.

**Typical range: 0 - 15 g/l**

### ClO<sub>2</sub> Generator Gas Concentration

In addition to the ClO<sub>2</sub> concentration measurements, using an AF26 sensor to measure the ClO<sub>2</sub> generator gas concentration at the inlet of the absorption tower helps optimize the ClO<sub>2</sub> generation process.

**Typical range: 0 - 20 % Volume**

### ClO<sub>2</sub> Vent Scrubber Monitoring

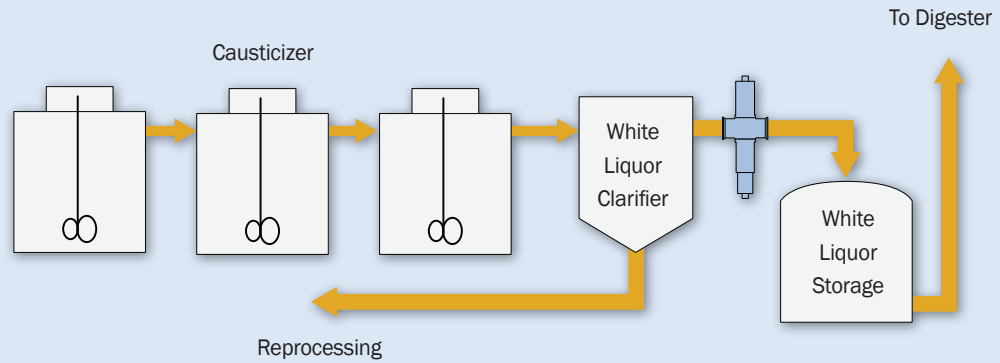
Vent gases are combined and sent to a wet gas scrubber where white liquor or weak wash is used as a reducing agent. The scrubbed vent gases are then transferred to the stack for discharge. For environmental control, residual chlorine dioxide measurements in the vapor phase are employed to reduce chlorine 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.

**Typical range: 0 - 500 ppm**



optek AF26-EX-HT-VB Dual Channel Absorption Sensor with Calibration Adapter



### 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 contamination. Installing a turbidity sensor after the white liquor clarification process allows for 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 the 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

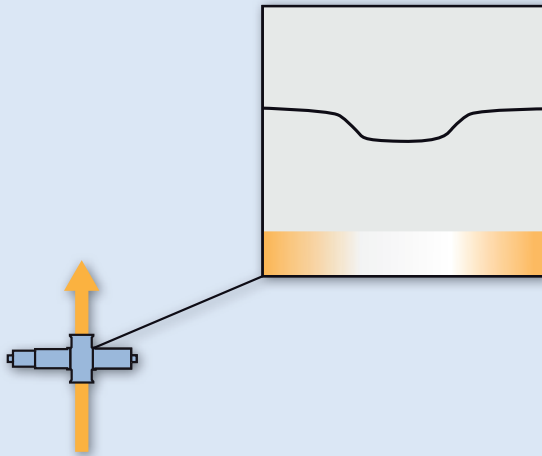
Achieving high quality white liquor and increasing digester performance leads to reduction of product losses and lime build-up downstream. This, in turn, reduces overall maintenance costs in chemical recovery.



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 accomplished by different methods, such as adding alums or by the absorption of activated carbon.

To optimize the performance of water treatment plants, the degree of yellowness (APHA/Hazen Color) should be monitored using optek's inline colorimeters. Specifically, the AF26 inline sensor can perform this task continuously and reliably, allowing the treatment plant to dose the decolorization agent in a controlled and optimal manner.

### Benefits

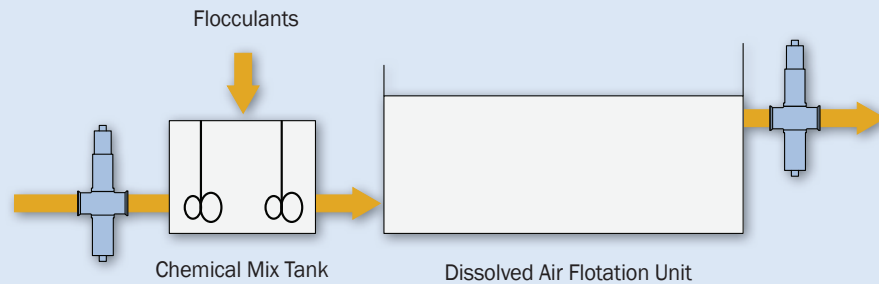
optek dual channel sensors ensure color measurements are independent from varying particulate levels or background turbidity. The first wavelength detects color, whereas the secondary wavelength compensates for these background influences.

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-VB Dual Channel Absorption Sensor with Calibration Adapter





### 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 the effluent is floated in a Dissolved Air Flotation device (DAF) with the aid of a flocculant.

Expensive sampling and analysis can be avoided by using an inline APHA/Hazen color sensor AF26. 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.

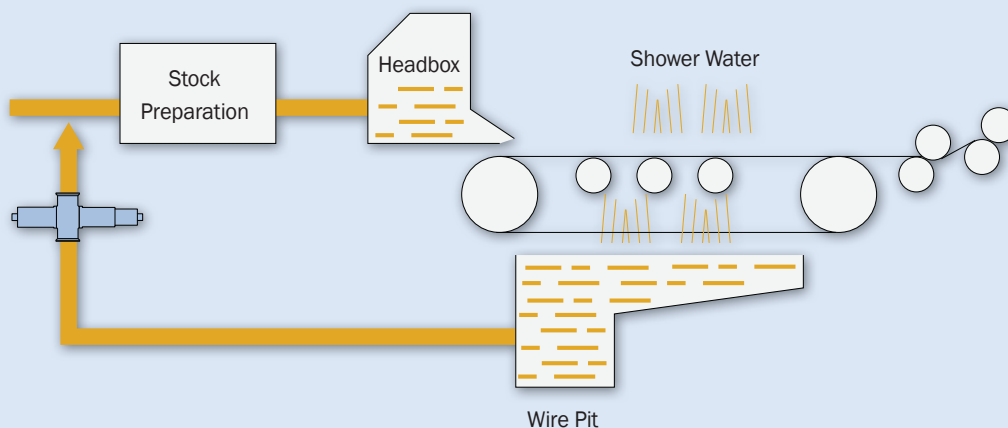
### Benefits

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-VB Dual Channel Absorption Sensor with Calibration Adapter

## 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 turbidity of this white water using an optek AF16-N near-infrared absorption sensor provides paper mills real-time information on the efficiency of the mesh web.

### Benefits

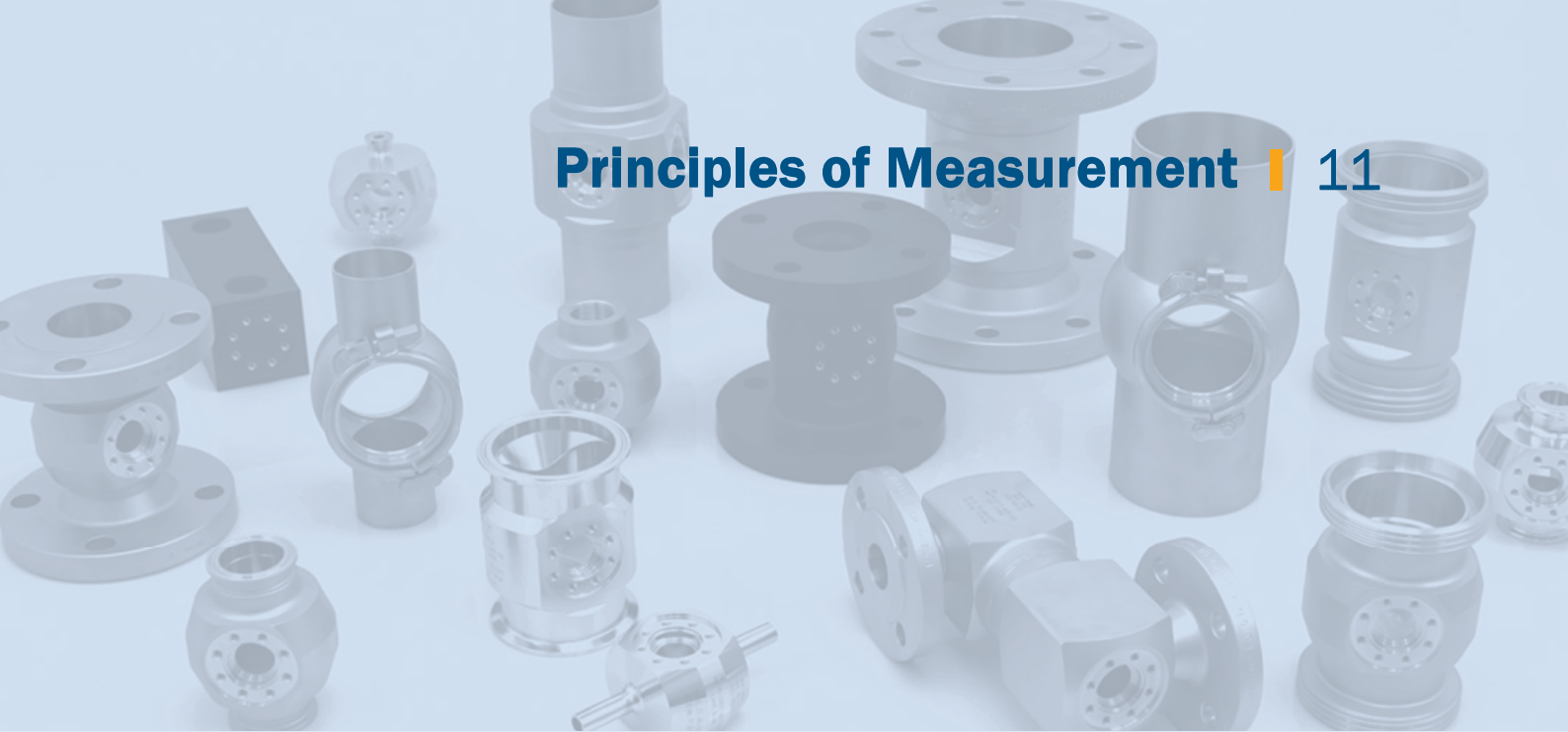
Waste treatment cost savings are realized by the recovery of usable fiber and fillers normally sent to a landfill or sewer. Also, by controlling particulate levels, energy consumption is reduced.

### Chemical Feed Control

In an effort to conserve and reuse mill process water, white water from the paper machines is typically sent through DAF units or other separation devices in which the remaining fibers and solids are removed by the addition of chemicals and/or flocculants. Using an AF16-N sensor for constant inline monitoring of the solids/turbidity before and after a DAF unit, the proper chemical dosage can be automatically controlled, allowing for chemical optimization, a consistent post treatment water quality and mill wide water use reduction.

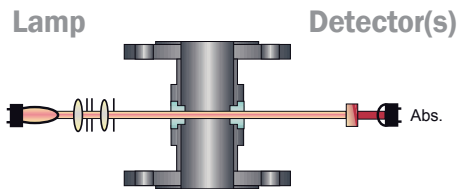


optek AF16-N Single Channel Absorption Sensor



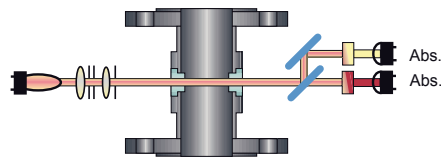
## Sensor AF16

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



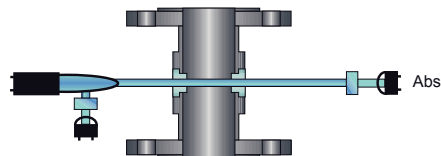
## Sensor AF26

VIS-Absorption, dual channel color measurement with turbidity compensation



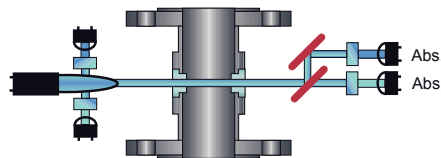
## Sensor AF45

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



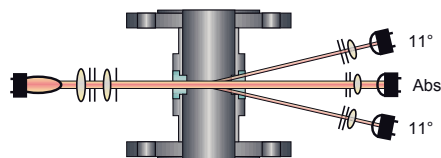
## Sensor AF46

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



## Sensor TF16

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





## Germany

optek-Danulat GmbH  
Emscherbruchallee 2  
45356 Essen / Germany  
Phone: +49 201 63409 0  
Fax: +49 201 63409 999  
E-Mail: info@optek.de



## USA

optek-Danulat Inc.  
N118 W18748 Bunsen Drive  
Germantown WI 53022 / USA  
Phone: +1 262 437 3600  
Toll free call: +1 800 371 4288  
Fax: +1 262 437 3699  
E-Mail: info@optek.com



## Singapore

optek-Danulat Pte. Ltd.  
25 Int'l Business Park  
#02-09 German Centre  
Singapore 609916  
Phone: +65 6562 8292  
Fax: +65 6562 8293  
E-Mail: info@optek.com.sg



## China

optek-Danulat Shanghai Co., Ltd.  
Room 718 Building 1  
No.88 Keyuan Road  
Pudong Zhangjiang  
Shanghai, China 201203  
Phone: +86 21 2898 6326  
Fax: +86 21 2898 6325  
E-Mail: info@optek-danulat.com.cn

## 中国

优培德在线测量设备（上海）  
有限公司  
上海张江科苑路88  
号德国中心718  
室 邮编:201203  
电话:+86-21-28986326  
传真:+86-21-28986325  
E-Mail: info@optek-danulat.com.cn

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