procemex®

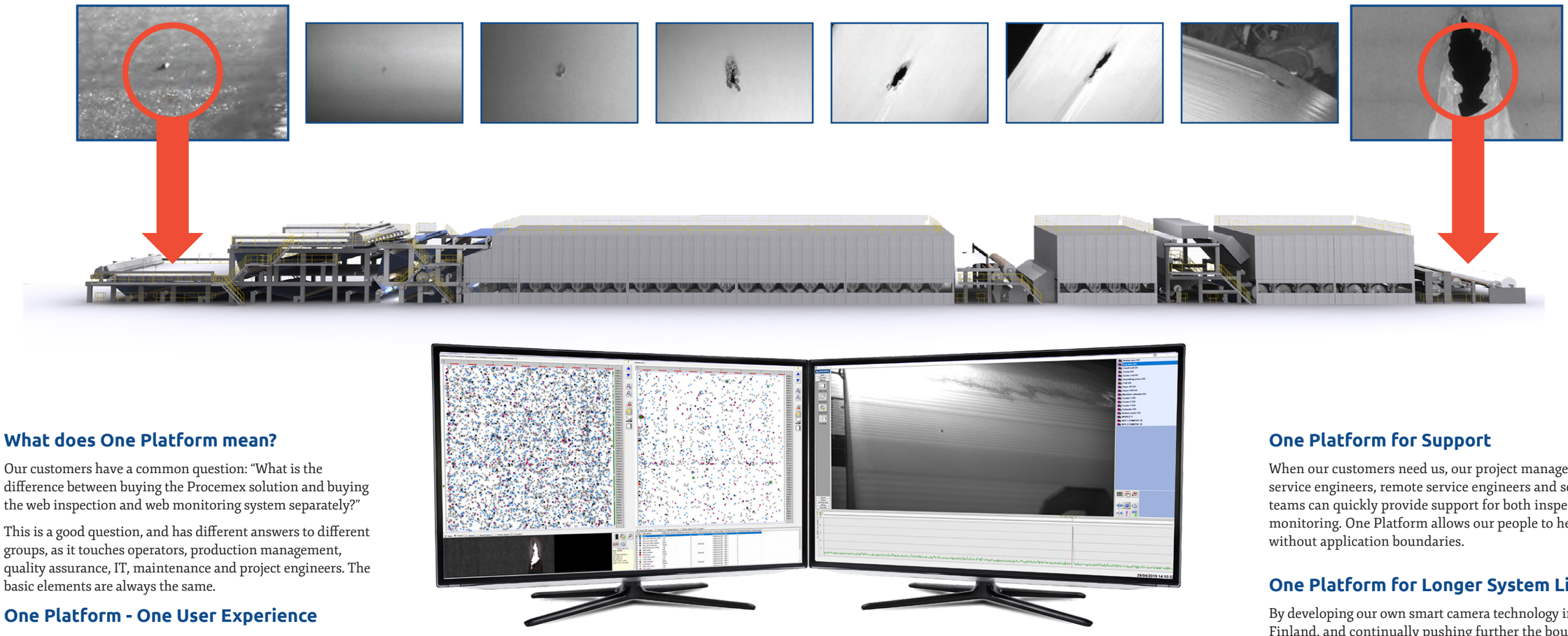
Web Monitoring and Inspection System

One Platform

Future Proof Investment

procemex.com

One Platform - Procemex Fully Integrated Web Monitoring and Inspection



What does One Platform mean?

Our customers have a common question: “What is the difference between buying the Procemex solution and buying the web inspection and web monitoring system separately?”

This is a good question, and has different answers to different groups, as it touches operators, production management, quality assurance, IT, maintenance and project engineers. The basic elements are always the same.

One Platform - One User Experience

The intuitive web monitoring & web inspection user interface is not designed for analyzing web breaks and paper defects separately. It has been designed to form one unified user interface, making it easy for operators to understand the inter-relations between web inspection and web monitoring and move flexibly between the ‘two systems’.
This makes it easy for operators to understand the real root causes for paper defects and web breaks created in the dryers, in the press, and in the forming section.

- One window into the inspection & monitoring world
- Pre-configurable paper defects activate upstream cameras
- Upstream camera viewing area define automatically which cameras are included in the same video
- Web inspection and web monitoring cameras synchronized with each other
- Upstream root cause video evidence is only one click away

One Platform for IT

As the Procemex Smart Cameras process the data already inside the cameras and send the results via TCP/IP Network to the server, there is need for only one server for the whole system. It manages the SQL database for storing and distributing data and communicates with 3rd party systems. When there is only one computer for the whole system’s data processing, that can contain over 200 cameras, this is beneficial, as it:

- Enables system virtualization by using Procemex server
- Enables system virtualization with preferred customer hardware and service
- Enables parallel server replication
- Enables easy backups

One Platform for Maintenance

In addition to the shared data storage infrastructure and user interfaces, it is also important that there is only one application software covering both web inspection and monitoring. This makes it easy for maintenance and application engineers, as everything is handled in one unified way and there is no need to learn two systems.

Web inspection and web monitoring also share the same lighting and smart matrix camera technology, eliminating multiple spare parts and extensive troubleshooting efforts.

One Platform for Support

When our customers need us, our project managers, field service engineers, remote service engineers and service teams can quickly provide support for both inspection and monitoring. One Platform allows our people to help you without application boundaries.

One Platform for Longer System Lifetime

By developing our own smart camera technology in Tampere, Finland, and continually pushing further the boundaries of camera performance, we have been able to go beyond the compatibility problems of fast turning computer and off-the-shelf camera world. It seems that the systems built on standard technology have today an average lifetime of 5 to 7 years due to component obsolescence from OEM hardware manufacturers and lack of compatibility in new components.

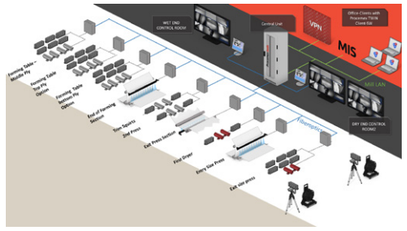
Procemex builds systems that are future proof and backwards compatible. This is our promise to our customers, and it is one of our key values in smart camera development.

All our systems starting from 2002 are compatible and can be extended or upgraded.

Web Inspection

Building defect detection on One Platform-architecture has elevated Procemex to the leading position in the global surface inspection and monitoring market.

The applications range today from coated box board to coated paper, magazine paper, newsprint, tissue and linerboard. In addition, utilization of autoshutter of smart camera design is preferred amongst specialty papermakers for its wide range of detection capabilities.



Higher Level Defect Detection with Photographic Imaging Quality

- Smart Camera Autoshutter provides even exposure and illumination over multiple grades and shades of color. This enables fully automated grade settings even with hundreds of paper grades and color shades.
- Square pixels, even with high speed processes, provide clarity for imaging
- Strobing provides powerful illumination peak to stop the web movement, eliminate blur and produce photographic image quality
- Industry leading camera sensor light sensitivity and image bit depth

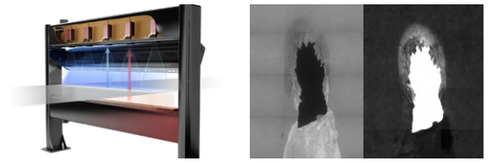
Powerful Strobe Lighting

- Camera activates LED flashing and illuminates only during camera image exposure. With strobing, heat generation is reduced due to reduced LED illumination time
- One camera can make several independent measurements by commanding different LED light profiles to flash sequentially
- The utilization of a strobed lighting technologies allows long life of LED by elimination of heat generation.
- Any LED segment can be changed at any time without creating a de-gradation in camera signals and the overall detection capabilities of the system.
- Procemex to take the next step in direction of 12 MPix camera resolution.

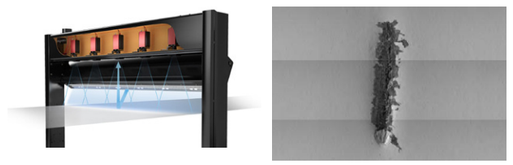
Different Detection Geometries

Transmission Web Inspection

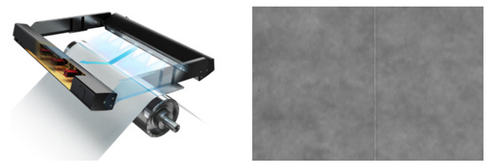
Alternating Light Web Inspection



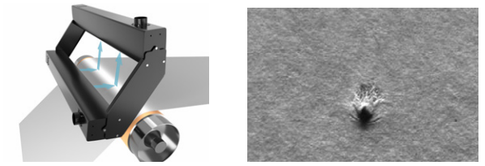
High Angle Reflection Web Inspection



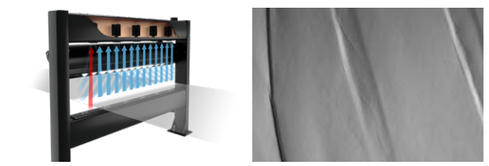
Low Angle Web Inspection



3D Defect Web Inspection



Side Light Web Inspection



"All Procemex delivered systems since 2002 are fully supported and compatible today"

Classification

- Pre-classification inside smart camera allowing instantaneous classification for first level defects
- Real-time outputs from first level defects
- Post-classification beyond single inspection frame measurement utilizing all data available for the most accurate classification
- Alternating illumination provides more information for the post-classification engine, increasing the benefits of the Smart Camera technology
- Advanced Classification utilizing VisionAppster platform for developing or acquiring best fit traditional and neural network classification algorithms

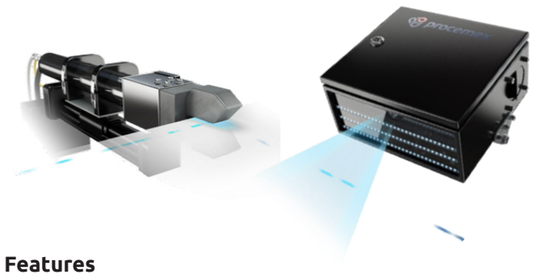
Multi-frame camera imaging providing higher quality images to the classification engine and increasing accuracy over antiquated line-scan technology.

Automatic Winder Target Control

Running winder with optimum efficiency; requires that winder operators know paper defect locations in advance. Based on accurate knowledge of the machine directional and cross directional defect location, operators can make educated decisions whether to keep full speed, slow down, crawl or stop the winder for patching the defect. This process can also be automatic.

- Ensure that winder is not forming a bottleneck for paper production
- Remove defects to meet customer specifications
- Winder and re-reeler defect stop accuracy achieved by bar coding paper edge at paper machine and by reading the code at the next production phase

Rolls can be run again after winder at re-reeler in case it is necessary to remove defects and save rolls. As the bar code is at that phase already removed, it is necessary to crawl the roll to the first defect and let the system synchronize the rest of the defects automatically.



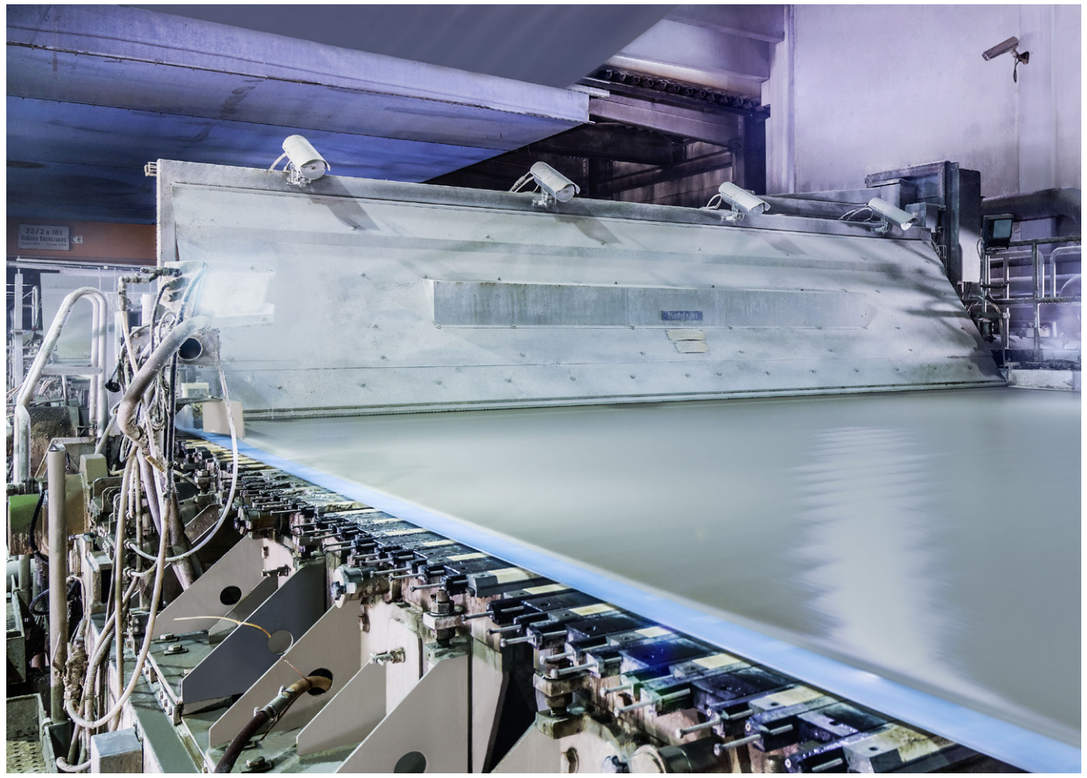
Features

- Enables automated re-reeler and winder stop features
- Increases production line throughput
- Code verification ensures PM availability
- Provides absolute sheet position regardless of slab-off and shrinkage
- Fast code reader cameras enable small code size and low ink usage, keeping environment clean
- Successful encoding up to 2000 m/min , 6500 ft/min

General Web Inspection System Features

- On-line defect map, that is scrolling down automatically as the paper passes by
- Each defect also includes a short, user definable streaming video
- Digital zooming without limits
- Formation measurement
- TAPPI/ISO-dirt count capable
- Includes reel number and paper grade data import from 3rd party system by using OPC protocol
- Dirt counter showing weight factor and number of defects per certain area
- Repeat defects, 100+ machine elements
- Trends 15min, 30min, 1h, 8h, 24h, weekly
- Profiles for different defects
- Report shift, weekly, monthly
- Reel report, reel number and length, which kind of fault, size, MD & CD location, fault count

Web Monitoring



Web Monitoring – Additional Eyes

Procemex Web Monitoring Cameras along the production lines provide additional eyes for operators and clarify what happened during the milliseconds when a web break took place. With enough cameras in the right locations, the cameras provide required accuracy and clarity about the root cause of an event. Additionally, integration with Web Inspection reduces downtime. The main obstacles for better machine efficiency are typically either number of cameras, or inferior image quality.

Inferior image quality is related to the following factors:

- The camera and light cleaning system
- Low camera shutter speed not capable of stopping the sheet movement
- Lens out of focus
- Low camera resolution
- Weak light source
- Light not synchronized with ambient light (uneven frame rate or missing sync)

Camera & Light Cleaning

Since 1994, Procemex has been gathering knowledge in various cleaning methods. Today the work is focused on perfecting pinhole camera cleaning technology and image quality. As most of the cameras are located in the forming and press section, it is clear that keeping cameras and lights clean in a harsh environment is important.

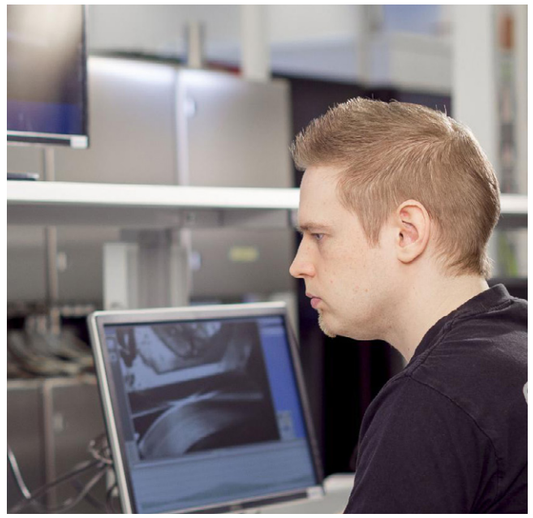
Lights are typically kept clean by applying a thin water layer on top of the protection window. The cleaning water also takes care of light cooling.

Procemex Pinhole Camera

Maintenance

The most typical reason for poor image quality is lack of maintenance. With a dirty camera and light windows, the camera shutter speed is often reduced too much. This makes the real time image look good, but the camera can´t stop paper web movement and recorded videos get blurred.

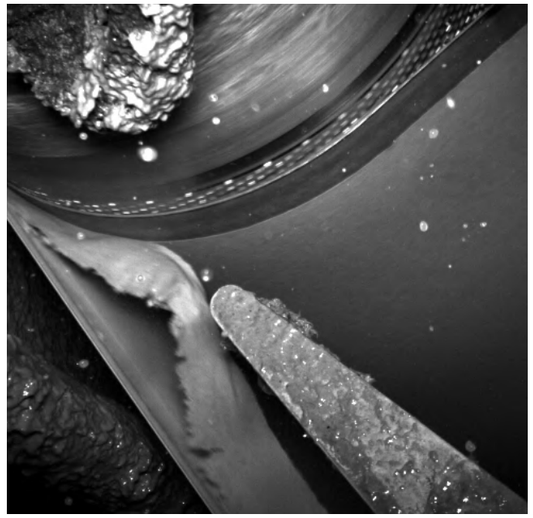
Web Monitoring field equipment should be under maintenance routines. In case help is needed, Procemex offers various service elements, starting from remote reports and ending to servicing the equipment under the service agreement.



Camera Resolution

Camera resolution tends to grow continuously and is with today's cameras more important than the frame rate. In practice, it is often difficult to utilize the highest resolution available, because the system is already using its full data transfer capacity. This is the most typical reason pushing customers to change their system. Today this is especially relevant, as 1 GigE network supports only 2,1 MPix resolution with 50 fps and 1,9 MPix with 60 fps. Resolutions above that are not possible without reducing frame rate.

Procemex camera resolution is not limited, as the camera processes data inside its own shell and doesn't send it to be processed elsewhere. When the video is completed inside the camera, it sends the file over network to the server. This architectural difference enables Procemex to take the next step in the direction of 12 MPix camera resolution.



Procemex Smart Cameras

Web Monitoring – Lights

Procemex uses LED strobe lights that can be synchronized with AC sync with ambient illumination to prevent a fade in-fade out effect from happening.

The latest LED technology is enhanced with custom designed focusing lenses, and optimized use of power. Procemex ECO LED Light has indirect cooling unit, that can use instrument air or water. The benefit of indirect cooling is that there is no instrument air inside the light, and that there is no possibility for over-pressurizing the housing and causing the protection window to explode.

Full Set of Tools for Results

Procemex Web Monitoring System assists operators in handling all production quality, and production efficiency items with the aid of a set of computer supported analysis tools.

- Full width visibility at wet end
- Superior resolution with 2,1 and 12 MPix Technology
- Unique Wet End Pinhole Frame covers full machine width
- Operators focus troubleshooting in right areas
- Paper and fabrics related issues covered
- Defects and root causes identified quickly through elimination method
- More efficient process
- Less paper quality issues
- Reduced reaction times

General Web Monitoring System Features

The Web Monitoring Software controls all functions of the system. With an intuitive graphical user interface, the operator selects a preferred real time monitoring mode between quad and single images, selects which events (breaks, web defects and image analysis) to analyze and asks the expert database to advise in problem solving.

Features:

- Selection of real time display mode (independently at dry end and at wet end if necessary)
- Breaks, defects, image analysis and other events are selected in event selection page with one click
- On the event selection page the system displays automatically created thumbnail images from all camera positions to simplify and make analysis faster
- Event analysis page includes easy-to-use image controlling functions both with video recorder type buttons and with slide bar
- Cameras are synchronized with each other within the accuracy of two frames
- Event analysis page includes special image change measurement trending
- Bookmarks can be tagged with images and image trends, and video clips can be edited as needed
- Digital zooming without limits
- Each camera features Region of Interest (ROI)
- The system recognizes image changes within each video clip and guides the operator
- Expert database to advise about problematic cases

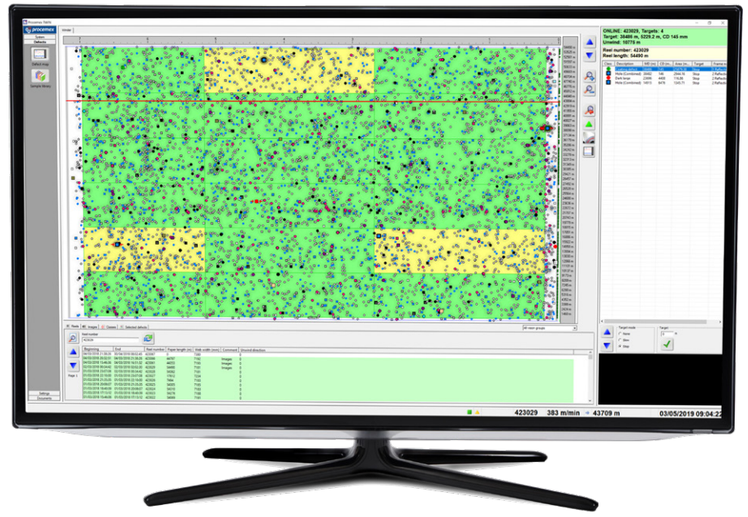
User Interface

">900 delivered systems and >10.000 Smart Cameras delivered for pulp/paper/print manufacturing"

Procemex Software ranges from small camera projects up to the greatest production lines in the world, covered by several hundred cameras.

- Web monitoring
- Web inspection
- Automatic winder control
- Formation measurement
- On-line dirt counting

- Real time images
- Long time recording
- Flying splice analysis
- Machine vision applications



Web Monitoring & Inspection Features

With an intuitive graphical user interface on dual screen, the operator selects whether he/she wants to analyze the root cause for a web break, view a paper defect and decide on follow-up actions, or to ask the expert database to advise in problem solving.

- Scrolling defect map with customer selected defect symbols displayed frame by frame or in overlaid mode
- Defect data displayed in the bottom and as tool tip on defect map
- Reel number and paper grade imported and displayed
- Possible to zoom in or zoom out defect map to cover several paper reels at the same time
- Activate/deactivate defect classes per each viewing location
- Planned customer roll set and defect density data overlaid on defect map
- Actual vs sold roll quality indicated by colored customer rolls
- Code verifying at paper machine with indication on defect map
- Trends 15min, 30min, 1h, 8h, 24h, weekly
- Profiles for different defects
- Report shift, weekly, monthly
- Reel report, reel number and length, which kind of fault, size, MD & CD location, fault count
- Periodic/repeat defects with machine elements data
- Upstream monitoring camera access with red button at the side of defect map
- Web Inspection camera displayed at monitoring camera list fully synchronized
- Selection of real time display mode (independently at dry end and at wet end if necessary)

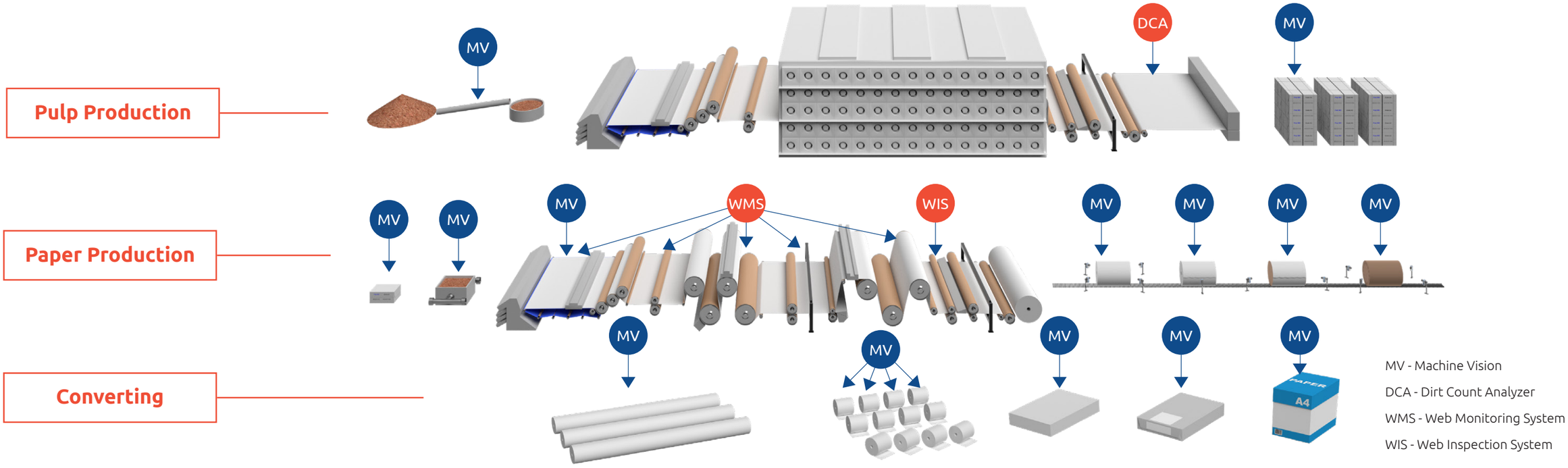
- Breaks, defect root causes and other events selected in event selection page with one click
- On event selection page the system displays automatically created thumbnail images from all camera positions to simplify and make analysis faster
- Event analysis page includes easy-to-use image controlling functions both with video recorder type buttons and with slide bar
- All cameras are synchronized with each other within the accuracy of two frames
- Bookmarks can be tagged with images and image trends, and video clips can be edited as needed
- Digital zooming without limits
- Each camera features Region of Interest (ROI)
- The System recognizes image changes within each video clip and guides operator
- Expert database to advise about problematic cases

Automatic Winder Target Control Features

With an intuitive graphical user interface, the winder/ re-reeler operator selects which defects call for some action in form of slowing down the machine or rejecting the defect.

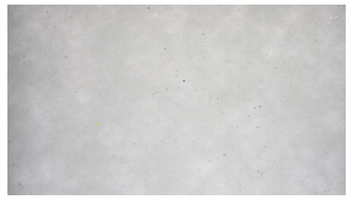
- Automatic/manual reel loading
- Defect map with customer roll cut and set positions
- Current position visualized with moving red line
- Selected slow down or stop targets indicated on defect map
- Defect image and data displayed at the bottom of user interface
- Code marking sync marks displayed at the side of defect map
- Code mark quality symbol, machine speed and width displayed at bottom of user interface

Procemex Machine Vision Applications

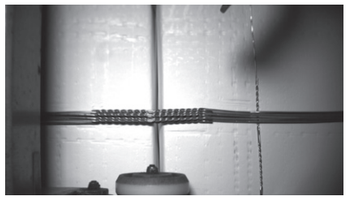


Applications for Pulp Industry

Chip Size Distribution Analysis



Pulp Furnish Dirt Count before Pulp Dryer



Pulp Bale Wrapping Applications

Examples of Converting Solutions

Tissue Log Roundness Analysis

Log position, log diameter accuracy checking.

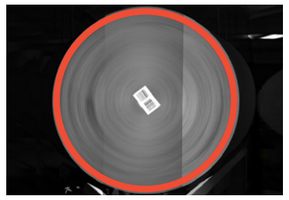
Tissue Roll Analysis

The length of cut rolls, cut quality in the end of the roll, cleanliness of the cut, and ovality of the roll and the core checking.

A4 Ream Analysis

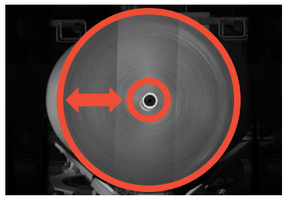
Quality checking of stacks of sheets.

Applications and Tools for Paper Industry



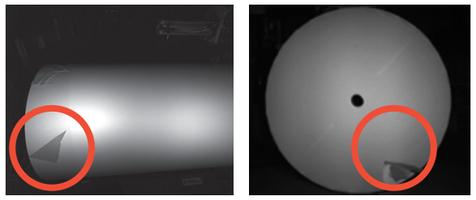
Roll Roundness

Images of both ends of the roll. Roundness value is sent to customer system via datalink.



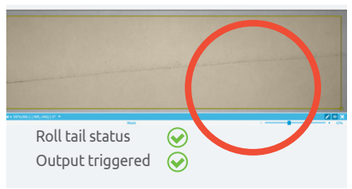
Roll Eccentricity

Images of center of the roll position and center of core position. Distance is sent to the customer system.



Roll Wrapping Analysis

Roll wrapping and headers are analyzed by cameras for defects such as torn wrapping.



Roll Tail Positioning

Information of roll tail position, so that wrapping is started from the right position.

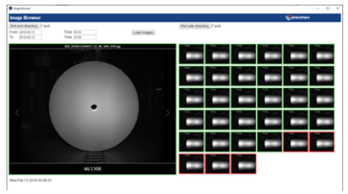


Image History Browser

Roll wrapping and headers are analyzed by cameras for defects such as torn wrapping.

Roll Header and Label Analysis

Roll header and label checking, analysis of bar codes and numbers. An alarm for critical faults triggered.

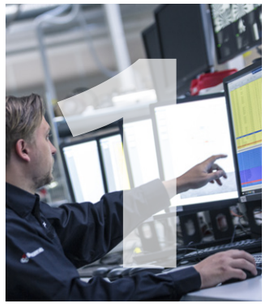
Procemex Service – Care to Excel

Focus on high productivity, reliability and performance

For ensuring machine and process running reliability with good product quality, it is essential to keep the machine vision system performing at its optimal level during its entire lifecycle.

In every turn, we are your partner in
- continuous development of your process with the most recent achievements of vision systems
- improving the performance of your existing camera system with upgrades, which can be phased over a certain time period
- Supporting best performance and optimized maintenance through your vision system's lifecycle.

Our full-scale services portfolio covers everything from 24/7 connected remote services to preventive maintenance and smart spare parts services.



Optimize process performance with low cost and high quality

Ensure machine and process are running reliably

Keep assets competitive throughout lifecycle

Get the right expertise when needed

SERVICE MODULES

1. Remote Service Desk 9/5
2. Remote Service Desk 24/7
3. Remote Diagnostics & Reporting
4. On-site Service Visit
5. Customized Training
6. Data & System Security Update
7. System Software Update
8. Spare Part Management
9. Runnability troubleshooting with mobile system

SERVICE AGREEMENTS

Tailored long term maintenance and process support program consisting of service modules most suitable for customer business.

SYSTEM MODERNIZATIONS

The latest Procemex technologies are available for your current systems and we guarantee backwards compatibility with existing products.

System extensions to meet the changes in process and to cover blind spot areas.

Predictable costs • Clear responsibilities • Continuous development
Increased inhouse knowledge • Improved process performance

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Higher Production Line Efficiency
Less Paper Quality Issues
Reduced Reaction Times

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