

COGNEX

SURFACE QUALITY MONITORING

Determine Surface Texture

Evaluate Surface Patterns

Confirm Overall Surface Quality

• Strip to Strip • Coil to Coil • Day to Day

In Real Time

**SMART
VIEW[®]**
METALS

Surface Quality Monitoring

SmartView® Surface Quality Monitoring (SQM) is a powerful tool for automatically measuring the surface quality characteristics of any web material. This revolutionary technology uses sample images of different surface qualities to determine the quality of the material during production. Actual quality values or labels associated with the sample images are automatically assigned to the material during on-line inspection.

Surface Quality Monitoring Benefits

In every surface-forming or treatment operation, there are one or more surface properties that can vary from time to time. These processes can have many variables that affect the surface appearance in different ways. Each process variable ultimately affects the price and the cost of the end product. The surface properties can be anything from the surface uniformity to the texture of the surface. The SmartView SQM package allows the operators to know the overall surface quality in real time. It can even predict the post-processing properties of the product when it is being produced. These revolutionary surface quality monitoring capabilities enable web producers to minimize the cost and maximize the price.



SmartView SQM Provides

- *Accurate real-time surface quality measurement*
- *Quality values or labels based on product-specific standards*
- *Easy system set-up and training using visual tools*
- *Data access through simple user interface, OPC, or ODBC*

Evaluate Almost Any Surface Property.

SmartView® SQM can evaluate almost any surface property using overall surface texture analysis. Surface texture itself, corduroy patterns, cloudiness, brightness, embossing, or even spangle uniformity are easily evaluated and reported in real time. This enables the operator to make process changes that impact quality before large amounts of off-spec material are made.

If you can see it, SmartView SQM can objectively evaluate it!

SmartView SQM Thinks Like You Do!

The system looks at the surface in much the same way humans do. It looks at an area of the surface and compares that area to what the surface is supposed to look like or what it has looked like in the past. The results are immediate and reported in terms that are currently used to describe the surface quality — terms everyone involved can easily understand.

For instance, if the material is characterized by the size and distribution of spangle patterns and you label them Poor, Usable, Good, Better, and Best, that is what SmartView SQM will report instantly as you are producing the material. Or if the same quality is measured by using a numerical scale from 1 to 10, that's the scale SmartView reports in real time.

Set-up Is As Easy As Everyday Use!

All you need to set up SmartView SQM is to collect sample images of the various quality levels that you want reported. Once the system knows what an image of Poor, Usable, Good, Better, and Best material looks like, it will report Good (material) when it sees Good material.

Even SmartView SQM training is very easy. Sample images can be collected on-line with a SmartView system. Quality labels or values associated with the samples can be determined using any existing on-line, off-line, or manual method the mill already uses. The SmartView SQM training software automatically sorts the images into proper groups. The user then assigns quality labels or values to those groups. It's that simple!



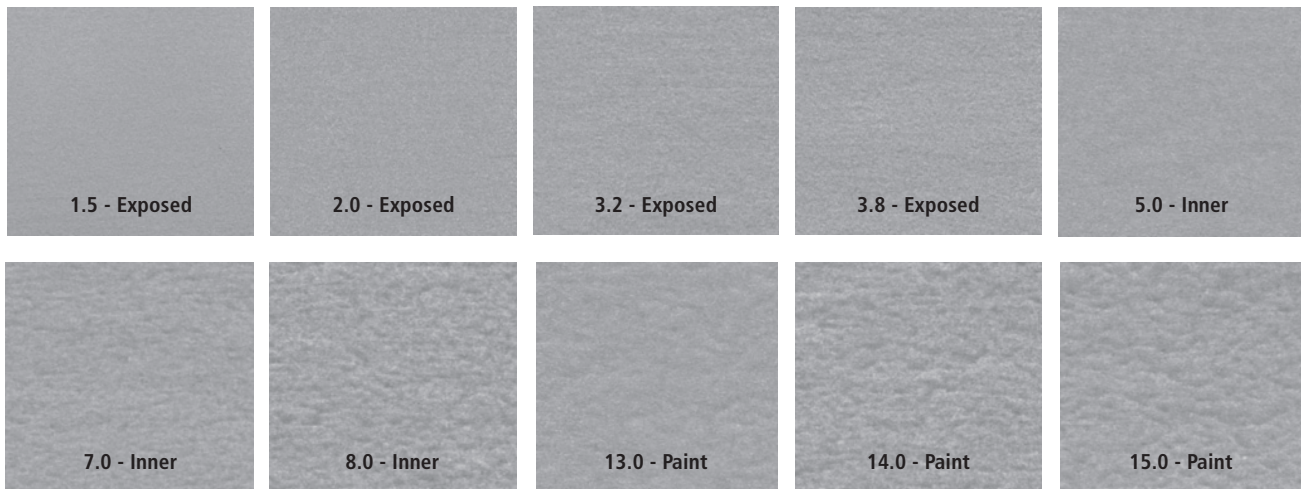
Automated Image Recognition Technology...

Actually, even though the use of SmartView SQM looks and really is very simple, what is going on behind the scenes is far from simple. SmartView SQM automatically analyzes and groups the sample images of the material. It uses advanced image processing technology to automatically sort images into groups where like images are in the same group and unlike images are separated into different groups. This way the system learns and memorizes what material of different quality looks like. These groups are then simply assigned labels or numeric values according to mill quality standards. This way the system learns what the user calls different quality levels. Through these two learning steps the system knows what an image of Poor, Usable, Good, Better, and Best or quality 1 – 10 material looks like. All this knowledge is then stored in the real-time engine that analyzes the material on-line. The on-line system will then use the same advanced image processing technology to recognize the images it sees. Thus it can automatically report Good (material) when it sees Good material or report quality value of 5 when it sees material having a quality value of 5.

Easy Method to Solve a Difficult Problem

SmartView SQM is used to determine the surface quality of various materials. In automotive steel the surface quality is very important. The production process has many variables that affect the surface appearance in different ways, but each process variable ultimately affects how the end product is used. By using the sample images in SQM, all the surface variations can be separated into different quality levels. During system training, the quality assurance engineers in this case assigned a number (overall quality) and a label (end use) to each quality level.

After downloading the training results to SmartView SQM, operators on the line can accurately monitor the surface quality in real time. With OPC, process-control systems are alerted immediately to changes in surface appearance so that surface appearance and process changes can be correlated. Surface quality data in the database enables business systems to track material quality. Overall, SmartView SQM standardizes the process of measuring the surface quality. Now surface quality measurements are 100% accurate, consistent, and performed continuously during production. SQM provides insights into identifying process problems, maximizing production of high-end goods, and lowering production cost.



Surface Quality Measurement

Spangle

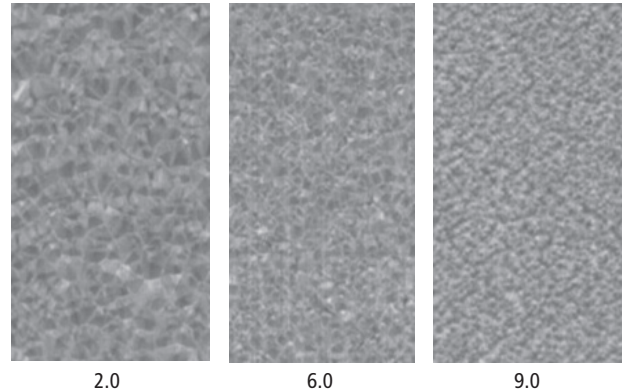
Surface quality measurement for steel

- Characterized by bubbly surface
- Spangle characteristics:
 - Pattern size
 - Pattern uniformity
- SmartView trained to recognize different levels of spangle
- Spangle measurements taken during inspection

BENEFITS TO THE MILL

- Automatically determine end user for coil based on the measured quality of the coil surface
- Immediately identify changes in spangle size or pattern introduced by changes in the process

Spangle Reported in Real Time:



Cloudiness

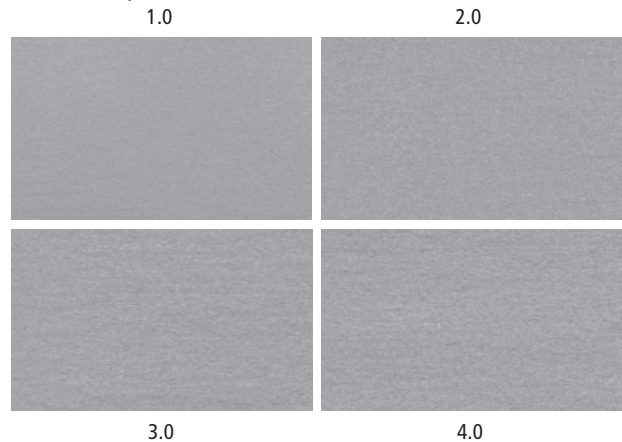
Cloudiness measurement for hot-dip galvanized steel

- Cloudiness characteristics:
 - Grain size: the larger the grain size on the steel surface, the worse the cloudiness measurement
 - Contrast: the greater the contrast within the graininess of the surface, the worse the cloudiness measurement
- SmartView trained to recognize different levels of cloudiness
- Cloudiness measurements taken during inspection

BENEFITS TO THE MILL

- Automatically determine end user for coil based on the measured quality of the coil surface
- Immediately identify changes in cloudiness introduced by changes in the process

Cloudiness Reported in Real Time:



Corduroy

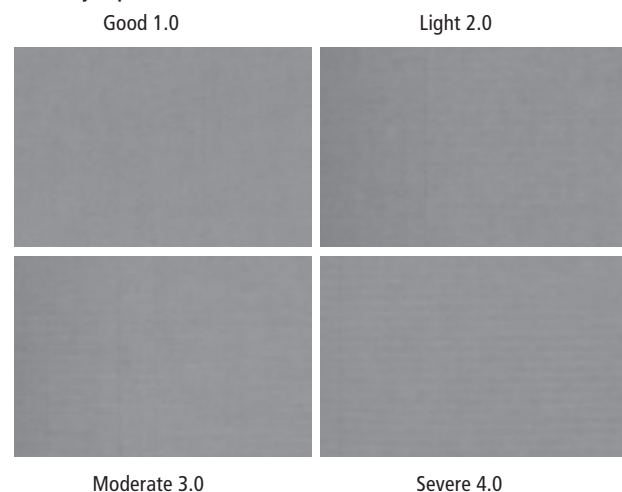
Corduroy measurement for aluminum can stock

- Characterized by gently curving repeating ridges that span the width of the strip
- Corduroy characteristics:
 - Ridges: the larger the ridges on the aluminum surface, the worse the corduroy measurement
 - Contrast: the greater the contrast between the ridges, the worse the corduroy measurement
- SmartView trained to recognize different levels of corduroy
- Corduroy measurements taken during inspection

BENEFITS TO THE MILL

- Automatically determine end user for coil based on the measured quality of the coil surface
- Immediately identify presence of corduroy introduced by changes in the process

Corduroy Reported in Real Time:



Since 1981, Cognex Corporation has achieved industry leadership by focusing its expertise exclusively on vision inspection technology. The success of our surface inspection division is enhanced by Cognex's financial stability and continued commitment to Research & Development, with more than 300 vision engineers worldwide. Our network of service and support professionals has made us the world's leading supplier of machine vision systems. Our goal is to exceed our customer's expectations by providing real, lasting value through innovative surface inspection solutions. Let Cognex ensure your success and guide you through your next generation of quality improvements.



Cognex Corporation designs, develops, manufactures, and markets machine vision sensors and systems, or devices that can "see". Cognex vision sensors are used in factories around the world to automate the manufacture of a wide range of items and to assure their quality. Cognex is the world's leader in the machine vision industry, having shipped more than 350,000 machine vision systems, representing over \$2 billion in cumulative revenue, since the company's founding in 1981. In addition to its corporate headquarters in Natick, Massachusetts, Cognex also has regional offices and distributors located throughout North America, Japan, Europe, Asia, and Latin America. Visit Cognex on-line at <http://www.cognex.com/>.

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