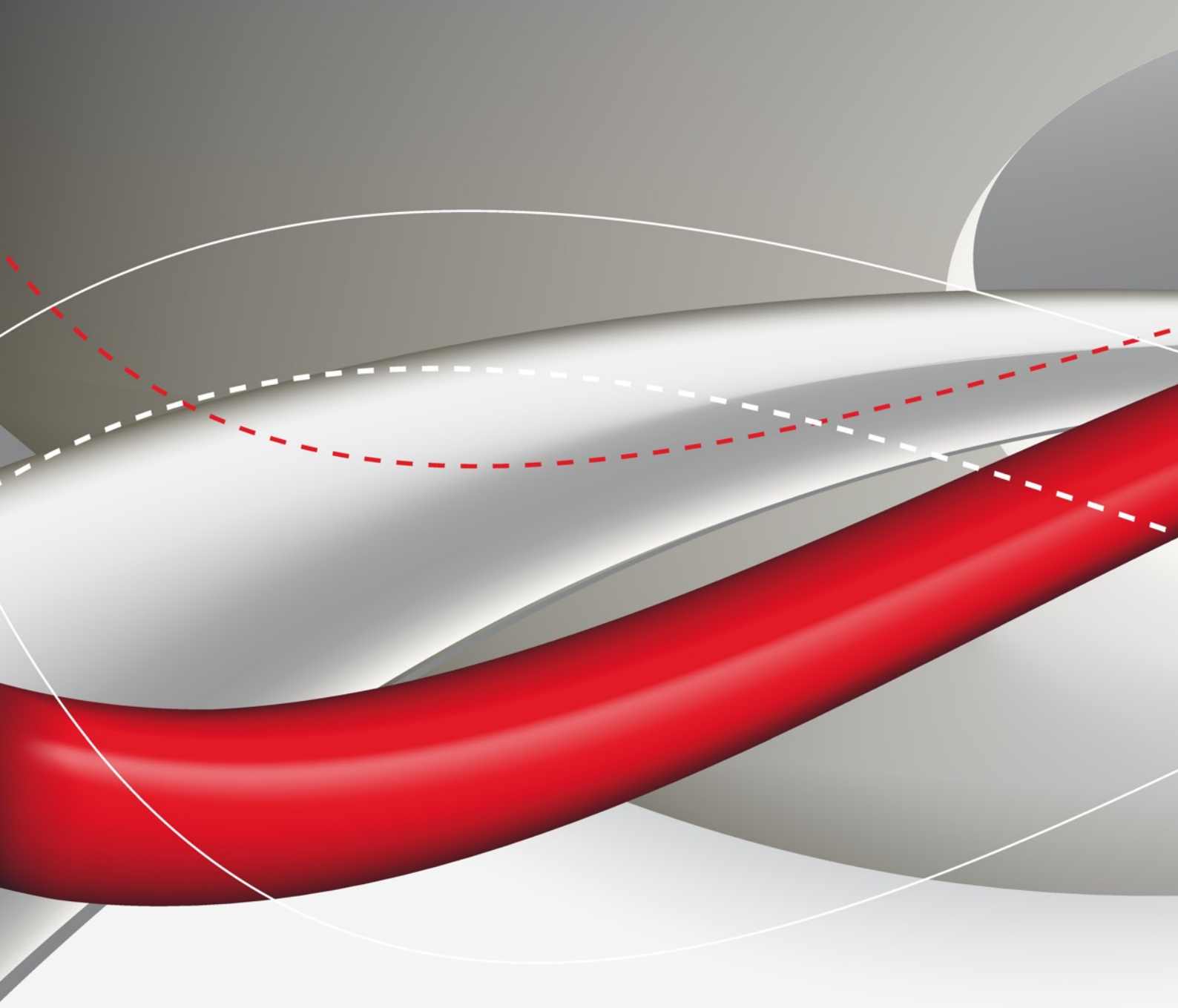

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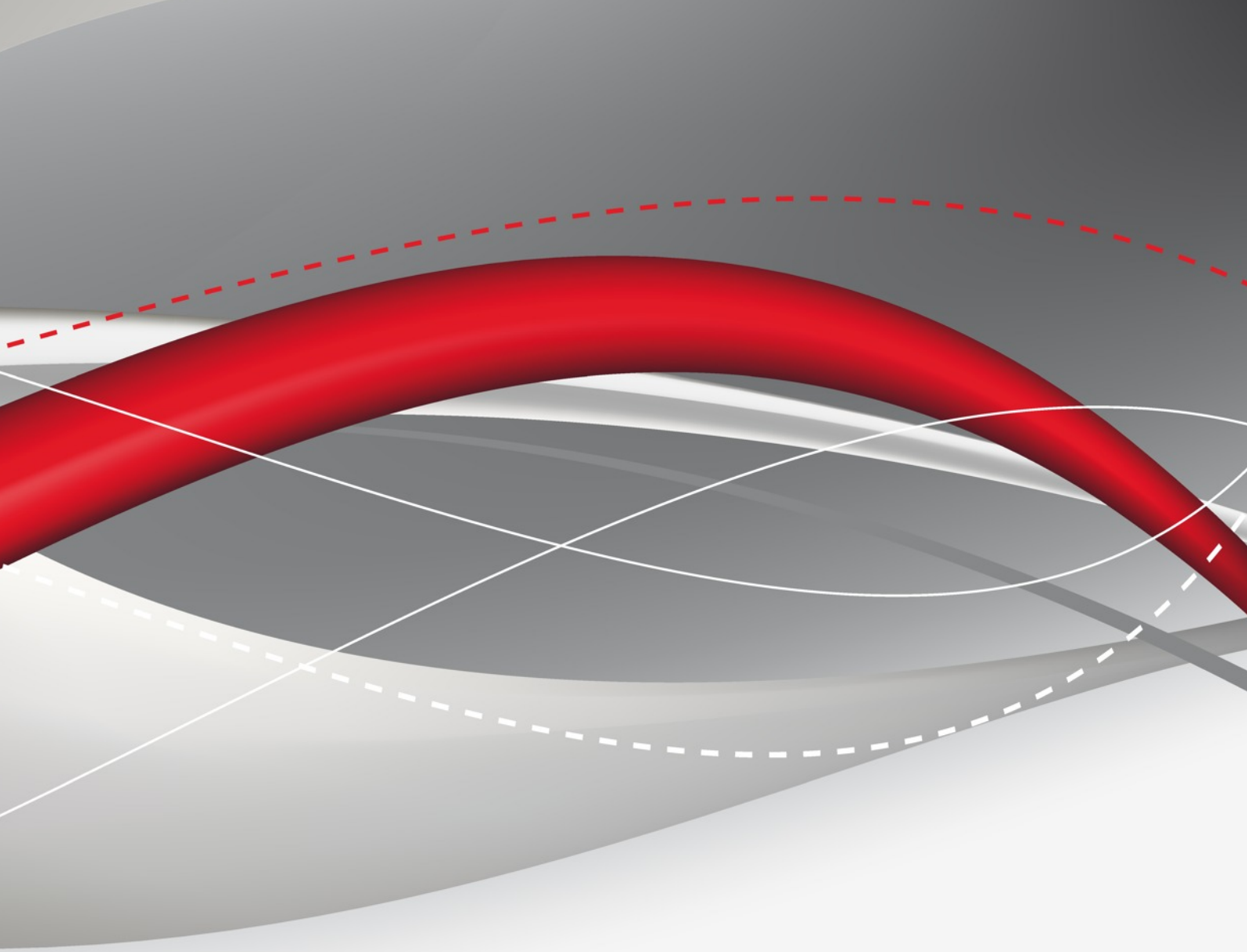

Applications Book

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EOPTIS designs and manufactures **innovative vision systems** for special applications and **optoelectronic instruments** for the in-line control of products and monitoring of manufacturing processes. Our customers use EOPTIS' products in the industrial, biomedical, security and food sectors.

Our know-how in **electronics, optics, mechanics and analysis algorithms** is used to design products available off-the-shelf or for custom OEM solutions. Advanced technologies are integrated with industrial-grade components , to manifacture reliable products with long-term availability and the best price/performance ratio.

This booklet collects several applications based on EOPTIS' products and technologies, either developed or suggested. Each sheet describes the guidelines of our catalogue products or custom applications originated by specific customer requests. In some cases, given the strong innovation nature o due to non-disclosure agreement, the description misses some key feature in order to protect the customer.

APPLICATIONS INDEX

ID	DESCRIPTION	SECTOR	3D	Measurement **	Recognition *	Hi-Dynamic	Multispectral	COMPLEXITY
APP 1010	Print quality control and text recognition	Packaging		√	√			❶❷③④⑤
APP 1020	Test-tube type identification, barcode reading and cap control	Pharma		√	√			❶❷❸④⑤
APP 1030	Barcode reading - spools and yarns color measurement	Textile		√	√			❶❷③④⑤
APP 1040	Gasket identification for sorting	Industrial		√				❶❷❸④⑤
APP 1050	Instrument and LCD display quality check	Industrial		√				❶❷③④⑤
APP 1060	Laser profilometer for blister filling control	Pharma	√					❶❷❸❹⑤
APP 1070	Impurity identifications in cosmetics raw materials	Food			√		√	❶❷❸❹⑤
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APP 1100	Dimension/color check on capillary vessels	Biomedical		√				❶❷③④⑤
APP 1110	Main color reconstruction	Textile		√				❶❷❸❹❺
APP 1120	Container localization and tracking	Packaging	√		√			❶❷❸❹⑤
APP 1130	Welding quality check with Hi-dynamic cameras	Packaging				√		❶❷❸❹⑤
APP 1140	Hi-dynamic recording on public transport	Transport				√		❶❷③④⑤
APP 1170	Micro-camera for dental inspection	Biomedical			√			❶❷❸❹⑤

Recognition * : Pattern, Characters, Codes, Image display, etc.
Mesaurement **: Color, dimensions, etc.

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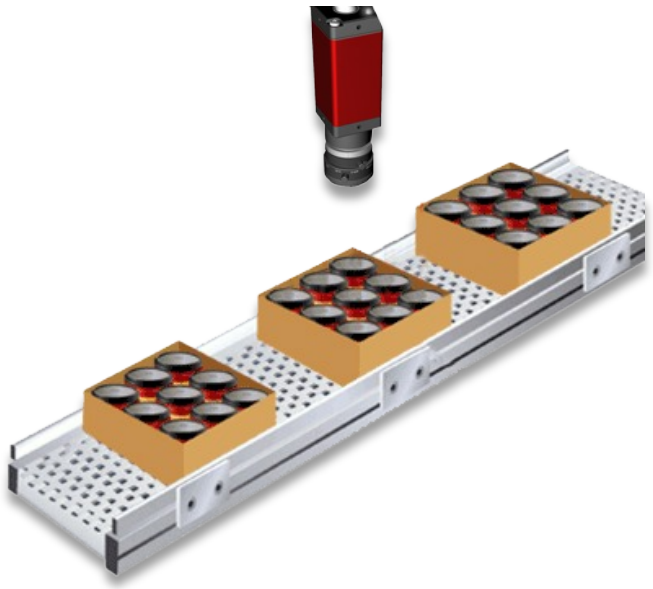
APP1010

Print quality control and text recognition

- ✓ Packaging
- ✓ Codes recognition
- ✓ Pattern recognition
- ✓ Color measure
- ✓ Multicontrol

Complexity

❶❷③④⑤



TECHNICAL FEATURES

- ***In-line control of Ink-Jet printed codes***
- ***Solution uses EOPTIS' Harware, B/W IP65 cameras, built-in illuminator***
- ***Automatic control on 9 different product types***
- ***Software setting via touch-screen***

1› CUSTOMER NEEDS

The customer needs to check the codes (alpha-numeric and barcodes) related to the product expiration date, product identification code and tracking number as well as the print quality, so that a stop signal will be automatically sent to the system in case of non-conformity. Furthermore, the solution has to be suitable to:

- Frequent format modifications
- Check on 100% of the products
- High rate line with uncontrolled illumination

2› SOLUTION

The proposed solution uses a high performance EOPTIS' hardware, with a B/W camera mounted above the conveyor. The proper illumination is ensured by a custom illuminator built by EOPTIS, coupled with the cameras. The system can work continuosly and could interact with an pneumatic system to control the product rejection.
A format change could be easily set via touch-screen interface.

- Solution completely integrated with the customer system
- Touch-screen system control

3› BENEFITS ACHIEVED

Real-time control significantly reduced the production stops, increasing the plant efficency with an investment return already after the first year of use.

- Less production stops and increased line efficency
- Higher granted quality

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APP1020

Test-tube type identification barcode reading and cap control

- ✓ Pharmaceutical
- ✓ Code recognition
- ✓ Pattern recognition
- ✓ Color measurement
- ✓ Multicontrol

Complexity

❶❷❸④⑤

TECHNICAL FEATURES

- ***EOPTIS' color camera, remote control, integrated illuminator and processing unit***
- ***Small camera sizeb (37x45x50 mm³)***
- ***Identification of 17 different test-tube types***
- ***Remote interaction with the control software via RS232***

1› CUSTOMER NEEDS

The main need is to communicate information like the barcode printed on the label, test-tube dimension and cap color (if any), to the shunting system. The requested operation must be carried out while the test-tube is moving and within a defined time interval.

- Test-tube identification
- Barcode reading
- Cap presence check - color classification

2› SOLUTION

EOPTIS developed a vision system that satisfies the customer needs using a single color camera and capturing a set of images when the test-tube enters the input gate.

- Single color camera vision system
- Multi-image acquisition

3› BENEFITS ACHIEVED

The implemented solution drastically reduced the error-ratio of the shunting system, allowing the process tracking and increasing the system efficency.

- Reduced error ratio
- Process traceability and increased efficency

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APP1030

Barcode reading, spools and yarn color measurement

- ✓ Texile
- ✓ Code recognition
- ✓ Color measurement

Complexity

❶❷③④⑤

TECHNICAL FEATURES

- ***Small-size IP65 color camera with integrated illuminator, remote control system***
- ***Color measure in Lab, RGB or YUV color spaces***
- ***Various barcode formats reading (linear and 2D)***
- ***System configuration via touch-screen***

1› CUSTOMER NEEDS

The customer needs to compare the color code (identified by the barcode applied on the spool) and the yarn's color, preventing errors in the next production stages.

- Barcode/yarn color congruity

2› SOLUTION

EOPTIS developed a single-camera system that identifies the yarn color and looking-up the customer database, verifies the congruity with the attached barcode. The system directly controls a stop signal for the automation system.

- Color identification and barcode congruity verification

3› BENEFITS ACHIEVED

The implemented solution reduced the production error ratio and incremented the system productivity, with an investment return after the first year of use.

- Reduced deficiency ratio
- Increased productivity

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APP1040

Gasket identification for sorting

- ✓ Automotive
- ✓ Motion tracking
- ✓ Dimension measure
- ✓ Color measurement

Complexity

❶❷❸④⑤

TECHNICAL FEATURES

- ***Remote controlled B/W camera with processing unit***
- ***Data communication via RS232 and Ethernet***
- ***Integration with system electronic***
- ***Software interface controlled via touch-screen***

1› CUSTOMER NEEDS

Automatic sorting and selection based on dimensional parameters and color of in-motion gasket.

- Identification
- Configurable parameters for dimensional and color classification

2› SOLUTION

EOPTIS developed a vision system that classify the in-motion gasket

- Easy system integration
- High efficency

3› BENEFITS ACHIEVED

Using EOPTIS' system the customer get full control on the products, granting a correct packaging. The integration of an automatic system reduced the human operation and packaging errors.

- Production costs reduction
- Higher quality

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APP1050

Instrument and LCD display quality check

- ✓ Automotive
- ✓ HI-Dynamic
- ✓ Pattern recognition
- ✓ Color measurement

Complexity

❶❷③④⑤

TECHNICAL FEATURES

- ***EOPTIS' color camera, remote control, integrated illuminator and processing unit***
- ***Custom EOPTIS' hardware***
- ***Integration with instruments test system***
- ***Control interface via touch-screen***

1› CUSTOMER NEEDS

The need is to automate the quality check of the LCD instruments screen produced by the customer. Each pixel must work correctly and the expected image must be displayed due to a given stimulus applied to the measure instrument.

- Control over 100% of the products
- Compatible with 8 different display types

2› SOLUTION

The system provided by EOPTIS is fully integrated with the customer's test equipment and is capable to check all the specified LCD displays without any custom configuration. With simple settings, the system can be scaled up to test new LCD display types.

- Full integration in the test system
- Simple configuration interface to scale compatibility with new measure instrument types

3› BENEFITS ACHIEVED

The use of this system allows to control the functionality of all the customer's products. The use of an automated system decreased the operators intervention during the quality check, reducing the verification costs.

- Lower productions costs
- Increased products' quality

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APP1060

Laser profilometer for blister filling control

✓ Pharmaceutical
✓ 3D vision

Complexity

❶❷❸❹⑤

TECHNICAL FEATURES

- ***3D vision system based on cames and laser line***
- ***Eye-safe laser (safety class 2M)***
- ***Full integration with the system electronics***

1› CUSTOMER NEEDS

The customer needs to check the presence/absence of the product in each blister's cell during the production process.

- Product presence control

2› SOLUTION

EOPTIS developed a vision system composed by a B/W camera and a laser blade that is capable to check the various blister formats used by the customer.
By analyzing the laser projected on the blister, the processing unit gets information about the blister's profile, indentifying whenever the product is missing and generating a stop signal for the main system.

- Complete control on products
- System suited for various blister formats

3› BENEFITS ACHIEVED

The integration of the system allowed the complete production control, ensuring a correct packaging. The use of an automated system avoided wrong packaging.

- Defection reduction
- Increased productivity

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APP1070

Impurity identifications in cosmetics raw materials

- ✓ Cosmetics
- ✓ Multispectral vision

Complexity

❶❷❸❹⑤

TECHNICAL FEATURES

- ***Multispectral camera***
- ***Processing unit and remote control***
- ***Integration with test system***
- ***Control interface via touch-screen***

1› CUSTOMER NEEDS

The vision system must find any impurity (hairs, insects, ..) inside high value raw materials bottles, mostly used in cosmetics production. The products to be inspected are in powder form, matte under visible light and the impurity rarely are on the external side of the bottle.

- Non visible impurity
- Control over 100% of the bottles

2› SOLUTION

EOPTIS developed a vision system based on a multispectral camera capable to analyze several images of the bottles, grabbed on different wavelength (colors), using also non-visible lights to penetrate inside the powder. The created system can manage various bottles and containers, and is suited to new control problems in an easy and fast way.

- Multispectral analysis
- Scalable to new bottles types

3› BENEFITS ACHIEVED

EOPTIS' vision system allowed a full quality check of the bottles, making the non-visible impurity relevation possible and guarantees the purity of the raw materials.

- Lower production costs
- Full quality

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APP1080

Print verification of color/characters

- ✓ Packaging
- ✓ Characters recognition
- ✓ Cholor measurement

Complexity

❶❷③④⑤

TECHNICAL FEATURES

- ***EOPTIS color camera, IP65***
- ***Multiple control color/characters***
- ***Touch-screen settings***
- ***Full integration with the main system***

1› CUSTOMER NEEDS

Verification of the right printing of variable characters and color in a given region of interest on the package. Packages that don't pass the quality tests must be automatically removed.

- Configurable Region Of Interest (ROI)
- System fully integrated in the production line

2› SOLUTION

EOPTIS developed a multicamera system that can be interfaced with the packaging system, and uses a dedicated processing unit with 3 cameras and a custom illuminator. The system is easily configurable using a simple user interface via touch-screen.

- Simple update of colors database and look-up strings
- Straight forward communication with the main system

3› BENEFITS ACHIEVED

Thanks to EOPTIS system, the quality check of printed strings and package color is now fully automated. Using the system, the non conformity have been significantly reduced, increasing the line productivity.

- Decreased product rejections
- Increased productivity and less control costs

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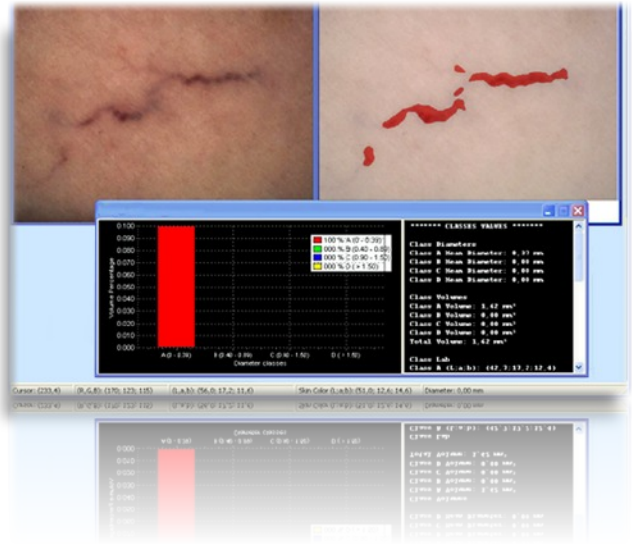
APP1100

Dimension/color check on capillary vessels

- ✓ Biomedical
- ✓ Color measurement
- ✓ Dimension measurement

Complexity

❶❷③④⑤



TECHNICAL FEATURES

- ***PC software for Windows OS***
- ***Integration with the image acquisition system***
- ***Dimensional and colorimetric analysis of vessels***
- ***Graphical interface managed by the operator***

1› CUSTOMER NEEDS

Simplify the analysis of superficial dilated capillary vessel, providing an easy to use software that can be interfaced with the image acquisition system.

- Simple graphical interface for the operator
- Automatic quantitative analysis

2› SOLUTION

EOPTIS developed an image analysis software that can be interfaced with the acquisition station. The system extracts the superficial capillarity vessels and automatically analyzes the main spectral components.

- Dimensional analysis of superficial vessels
- Colorimetric control

3› BENEFITS ACHIEVED

Thanks to the automatic system, the analysis method has become more efficient, repeatable and faster compared to the manual-based one.

- Decreased analysis time
- More efficiency
- Standardization of analysis results

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APP1110

Main color reconstruction

- ✓ Texile
- ✓ Color measurement
- ✓ Software reconstruction

Complexity

❶❷❸❹❺

TECHNICAL FEATURES

- ***Color measure in Lab color space using handheld instrument***
- ***Database colors mixing percentage configurable by the end user***
- ***Database update via USB 2.0***

1› CUSTOMER NEEDS

Genearation of a virtual texture that reproduces the measured average color, created using the available database colors.

- Configurable mixing parameters
- Handheld device

2› SOLUTION

EOPTIS developed a system composed by a handheld colorimeter, that can be used with any Windows-based PC, and a custom software. The user can easily update the colors database, used by the software to generate the virtual texture, and set various mixing parameters (mix percentage, fixed colors, …).

- Easy to use device
- Simple update of the colors database
- On-screen visualization of the generated pattern

3› BENEFITS ACHIEVED

The selection process of the texture colors , and the production of texile test patterns, was optimized thanks to EOPTIS automatic system.

- Increased production efficiency
- Simplified interface between the production company and the interior designer
- Decreased costs

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APP1120

Container localization and tracking

- ✓ Packaging
- ✓ 3D vision
- ✓ Pattern recognition

Complexity

❶❷❸❹⑤

TECHNICAL FEATURES

- ***3D vision system based on camera and laser blade***
- ***Laser safe for the operator (safety class 2M)***
- ***Full integration with the system electronics***

1› CUSTOMER NEEDS

To get the container position over a conveyor belt and pass the information to pick&place systems. In the meanwhile, check the printed barcode for product tracking.

- Communication with remote system for product tracking
- System stop signal sent in case of non conformity

2› SOLUTION

EOPTIS developed a vision system using a 3D laser profilometer module. Starting from the 3D reconstruction, the system acquires the position-related information, to be sent to the pick&place system. The camera is also used do decode the printed barcode.

- System fully integrated in the production line
- Decoded barcode sent via ethernet to the remote system
- Hi-performance analysis

3› BENEFITS ACHIEVED

The use of the EOPTIS compact vision system allows to contemporary automate two complex procedures. At the same time the communication of the decoded barcodes allows the complete tracking of the released products.

- Complete control over the production line
- Two complex controls carried out by a single, compact system

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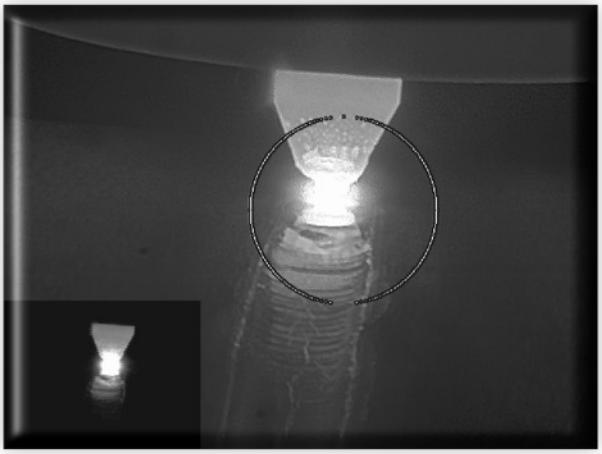
APP1130

Welding quality check with Hi-dynamic cameras

- ✓ Industrial
- ✓ Hi-Dynamic vision
- ✓ HD Video recording

Complexity

❶❷❸❹⑤



TECHNICAL FEATURES

- ***Hi-dynamic EOPTIS' camera (120dB)***
- ***Remote processing unit and visualization***

1› CUSTOMER NEEDS

The customer needs to have a camera system that allows to monitor the welding process in real-time using a monitor. The system must be capable to display both the welding area (high light intensity) and the adjacent area (low light intensity).

- Welding process visualization
- Manage images with an extended luminosity range (1:1.000.000)

2› SOLUTION

EOPTIS developed a vision system using a hi-dynamic range camera (120dB) that allows to grab and display in real time both the welding area and the adjacent region. The results was achieved thanks to a custom algorithm developed to allow a proper control of the sensor and a correct data processing.

- Hi-dynamic range camera
- Image processing to display relevant areas

3› BENEFITS ACHIEVED

EOPTIS' vision system allows an optimal remote control of the welding process, improving the process quality, the operators' safety and the production efficiency.

- Improved welding quality
- Less welding time
- Increased efficiency

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APP1140

Hi-dynamic recording on public transport

- ✓ Transports
- ✓ Hi-dynamic vision
- ✓ Video recording

Complexity

❶❷③④⑤

TECHNICAL FEATURES

- ***System certified for railway applications***
- ***Removable video storage device***
- ***Hi-dynamic camera suitable for night time recording (hi-contrast scene)***

1› CUSTOMER NEEDS

The need is to record a tram from the pilot cab during the normal operations, in order to record infractions on railway crossing. The customer points out the problem of hi-contrast night time scenes that dazzles a standard camera, generating unusable recording.

- Day/Night operations
- Operative on public transports

2› SOLUTION

EOPTIS developed a solution based on a Hi-dynamic range camera and installed it on the customer's vehicles in order to validate the performance by mean of a comparison against a traditional.

- Hi-dynamic range camera
- Digital recording unit with high storage capacity (last 100 hours recording)

3› BENEFITS ACHIEVED

The images recorded during the test phase highlighted the capability of EOPTIS' camera to globally preserve colors in hi contrast scenes (light spot on dark background). Thanks to the high dynamic of the system, the recorded images can be used as infractions history even in the night time.

- Hi quality images in every light conditions
- Configurable solution

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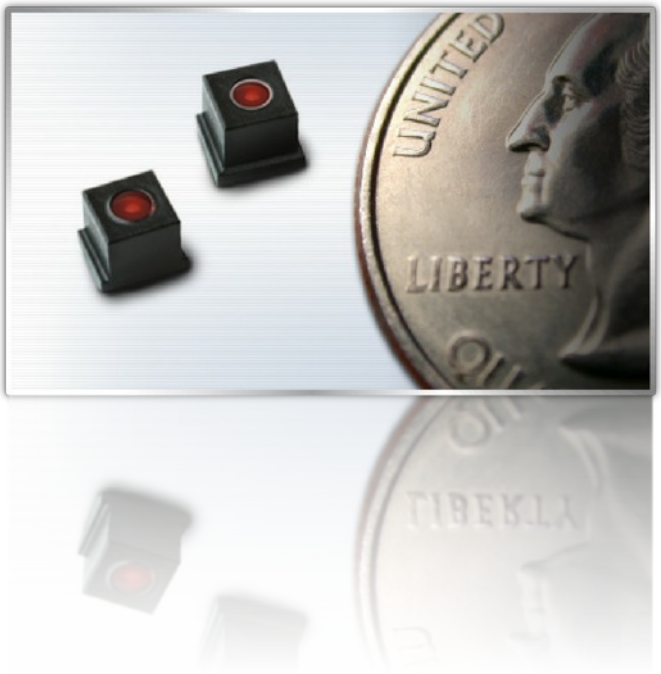
APP1170

Micro-camera for dental inspection

- ✓ Medical
- ✓ Visualization

Complexity

❶❷❸❹⑤



TECHNICAL FEATURES

- ***Miniaturized color camera***
- ***Integrated in the dentist's armchair***

1› CUSTOMER NEEDS

The customer manifactures dentists's armchairs and needs a system that can display the oral cavity the patient on a monitor. The dentist uses the images to better explain the operation to the patient. The system needs to be fully integrated in the dentists armchair, both from technical and aesthetical point of view.

- Display of the under dental surgery area
- Full integration with the dentist armchair

2› SOLUTION

EOPTIS proposed a solution with a miniaturized camera with an integrated light source, packaged as a dental surgeon tool. The resulting system is an handy tool for the dentist, non-invasive for the patient. Tha camera send images to a visualization unit that can drive both a small monitors (3.5") mounted on the chair (for the patient) and a bigger one (for dentist assistant).

- Intra-oral miniaturized camera
- Visualization unit with two video output

3› BENEFITS ACHIEVED

EOPTIS developed an easy to use system, that delivers good quality images without particular settings. The result is a tool that effectively improves the communications between the doctor and the patient. The dentist benefits from this and the armchair manufacturer has created a differentiation factor and gained competitive advantage.

- Hi quality with an easy to use tool
- Differentiation factor

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