FOCUS on

who WE are

EVK, an expert company in **industrial imaging**, offers sensor-based solutions for bulk **sorting** and **inspection** in the fields of food processing, pharmaceutical processing, recycling and mining.

EVK's core expertise is in classification of data using hyperspectral and conductivity imaging technologies. The company provides products and services from data acquisition to decision making, thereby offering complete **sensor-based** solutions to sorting and inspection system builders.

EVK possesses a proven track-record of its products operating in a number of **industrial fields**.

WE EXCEL IN developing **SENSOR-BASED** technologies that will meet **YOUR** challenges in the fields of

- Sorting of bulk material
- Inspection and Monitoring
- Process Analysis
- Process Control

and what we can do for YOU

ALL IN ONE SOLUTIONS FROM SENSOR TO VALVE ACTUATION

- Smart Sensors with embedded Material Classification Engine
- Fusion of multiple sensor technologies
- Application support and customized services

APPLICATIONS DESIGNED FOR INDUSTRIAL USE

- Solutions from concept development to machine implementation
- Interconnected solutions for real-time Sorting and Monitoring
- Rugged, industry-proven products

DATA INTELLIGENCE

- Data processing from raw data input to decision making
- Information dashboards for process inspection and control
- Data Analytics

Technology

Chemical Imaging

Is a novel Hyperspectral camera inspection technology that can spatially resolve chemical data. The chemical sensitivity range of a Hyperspectral camera can be tailored, by choosing the spectral range (VIS, VISNIR, NIR and SWIR), to suit any given application. Chemical Imaging can thus classify objects and/or parts of objects according to their chemical composition and can output chemical distribution maps that are not affected by the colour of objects. The sensitivity to chemical data makes it possible to quantitatively measure chemical properties such as: Dry matter, protein, sugar, starch and calorific value.

Sensor-Fusion

Sometimes only a combination of various measurement techniques can deliver the results needed for a particular sorting application. EVK offers the software and hardware tools needed to combine all our imaging techniques into a single decision making Sensor-Fusion module that can logically couple the different classification results from various individual sensors. The unified classification result is computed in real-time and will steer the ejection unit appropriately. In this way measurements ranging from chemical composition, colour, electrical conductivity, size, structure and shape will improve the sorting accuracy for very complex applications.

Conductivity Imaging

Conductivity Imaging senses the electrical and magnetic properties of different materials. The basic application is the detection and classification of both ferrous and non-ferrous metals. Different metals can be detected and sorted out from a bulk flow, with minimum object sizes in the millimetre range (e.g. single copper threads).

Colour Imaging

Colour Imaging uses traditional RGB colour line cameras that can classify objects based on their colour hue and intensity. The very high line scanning speeds make Colour Imaging suitable for measuring the colour, structure and shape of objects on very fast conveyors.

Recycling

Thanks to sensor-based sorting, reclaimed raw materials from Urban mining and recycling play an important role these days in manufacturing industries. For example, glass making, paper production and plastic manufacturing all depend (sometimes close to 100%) on recycled materials. The caveat is, that in order to maintain a defined production quality when manufacturing with recycled materials, it is imperative to correctly classify and grade them beforehand.

Near Infrared Hyperspectral Imaging offers the degree of classification accuracy necessary for recycling, by directly measuring the chemical molecular composition through the absorption of light (spectroscopy). Other techniques such as Conductivity Imaging offer the level of quality control required for recycling of metals in manufacturing industries.

EVK's portfolio of sensor-based sorting technology includes Colour, Hyperspectral and Conductivity Imaging systems, which can be used individually or, with Sensor-Fusion, can be combined to form a powerful sorting application that can process multiple material types.

Analysis

Plastics

- Cap (PE-HD)
- Body (PET)

Case Separation of bulk material in heterogenic waste streams

Problem **Colour cameras can only process information in the visible light band.**

Solution EVK's NIR Hyperspectral Imaging Systems can accurately detect different materials according to its chemical composition. This feature allows the EVK systems to operate in fields where colour cameras reach its limits. Moreover, the combination of a Colour- and Hyperspectral Imaging camera vie Sensor Fusion is an often-used solution to increase sorting sensitivity and specificity. This allows to separate materials by means of their colour, shape, size and in addition the chemical composition.

Typical applications of EVK

Separation of pure plastic material

PET bottles

Hyperspectral Imaging and Colour sorting according to customer needs
Foreign body removal (i.e. Metals, diff. Plastics)

Plastic flakes and granulate material: PET, PE, PS, PA, ABS, PP, PC, PVC
Separation of PVC from refuse derived fuels to prevent leakage of (moisture, NCV, GCV) during the combustion process.

Technology Chemical Imaging, Colour Imaging, Conductivity Imaging, Sensor-Fusion

Food

The first sensor-based sorting in food production was developed in the 1940's and has continued growing ever since. Today, food sorting leads the market with the highest growth rate – and potential for further growth – in the sorting industry.

The high priority placed on food safety makes food sorting a very demanding application. High classification and spatial accuracy are required to eliminate any chance that slightly defective products or small foreign materials (e.g. glass shards or metal wires) will reach the customer. It is therefore the case that the reputation and financial well-being of food producers depends on the effectiveness of the food inspection and sorting systems they use.

The complete surveillance of food quality, from sensor-based sorting of raw materials, in-line inspection during production and final inspection before packaging, is rapidly becoming an imperative in today's high standard food industry.

EVK pioneered the introduction of NIR Hyperspectral Imaging in the food industry in 2011. Worldwide hundreds of food sorting machines, powered by EVKs proprietary Hyperspectral Imaging technology, help to ensure food safety and to keep a high degree of quality control via real-time quantitative analysis and integrated Process Analysis Technologies (PAT).

Analysis

Peaches

- Concentration measurements
- Defects

Case Ripeness determination in food processing

Problem **To date there exists no in-line inference method for the determination of fruit ripeness covering the whole product stream.**

Solution Hyperspectral Imaging can be used to quantitatively determine fruit ripeness in real-time, 24/7. This can replace more traditional spot checks and lab-based analysis that are discontinuous and slow. Real-time quantitative data of fruit ingredients such as water, sugar and other SSC (soluble solids concentration) can be interfaced with existing PAT (process analytical technology) to optimise grade sorting to reduce costs and ensure high product quality.

Typical applications of EVK

Foreign body removal and quality measurement in the food industry

Fresh produce, dried food, frozen food
Hyperspectral Imaging and Colour sorting according to customer needs

Foreign body removal (i.e. Metals, diff. Plastics, bones)
Quality measurement (i.e. sugar content, ph-value, moisture)

Technology Chemical Imaging, Colour Imaging, Conductivity Imaging, Sensor-Fusion

Mining

The mining industry was an early pioneer in sorting technology development, and for centuries it led the improvement of mechanically assisted sorting of valuable ores from waste rock. A classic example is panning for gold by washing riverbed deposits.

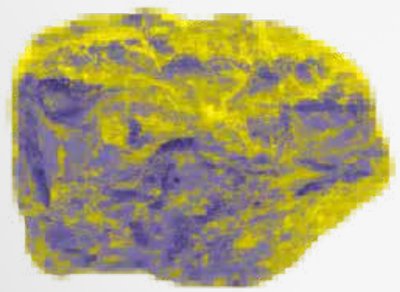
Nowadays, more challenging sorting applications are possible with sensor-based sorting technology. Simple monochrome camera sensors, which are very effective at detecting and classifying minerals based on their relative brightness, have for example, given way to much more sophisticated colour, hyperspectral and x-ray fluorescence detection techniques. These techniques, when specifically adapted for sorting, can accurately determine the chemical composition and spatial distribution of minerals in rocks.

EVK is a pioneer company since the 1980's in developing advanced camera systems for sorting technology. EVK has pushed the innovation of full Colour Imaging and Chemical Imaging, with its range of HELIOS Hyperspectral Imaging cameras, to attain higher accuracy and set higher standards for the sorting industry. With this technology, EVK can guarantee a pure stream of valuable ores in the production line, with all waste rock precisely identified and removed.

Analysis

Minerals (Bornit: Cu5FeS4)

- Cu Content: 55–63%
- Gangue



Case — Improving yield using efficient sorting technologies

Problem — **The mineral extraction of Calcite from rock ore is often hampered by the natural occurrence of Chalk in the same ore. The high variability in rock ore composition and size requires a precise chemical mapping of each stone, whether large or small, in order to improve the extraction yield.**

Solution — Sorting machines based on our camera technology can accurately sort down to very small sizes with user settable weightings for each mineral present. This allows the production yield of Calcite to be carefully controlled and ensures that the yield is not dependent on rock ore sizes.

Typical applications of EVK

Sorting and detection of valuable minerals or rock

Copper ore, Talcum
Hyperspectral Imaging and Colour sorting according to customer needs

Determination of different materials with regard to its chemical composition (i.e. Talcum)
Quality measurement (i.e. copper ore)

Technology — Chemical Imaging, Colour Imaging, Conductivity Imaging, Sensor-Fusion

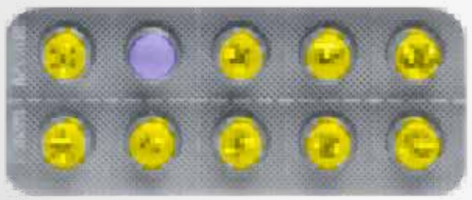
Pharmaceuticals and chemical industry

Hyperspectral Imaging is becoming an attractive process control technology for the pharmaceutical industry. Driven by the success in food quality and safety assurance, EVK has adapted Hyperspectral Imaging to be used as part of the PAT in the production line of pharmaceutical medicines.

Detailed calibrated quantitative maps of API (active pharmaceutical ingredients), for instance in pill production, make EVK's Hyperspectral Imaging cameras very suitable for in-situ quality inspection and control. With several spectroscopic ranges available (VIS, VISNIR, NIR and SWIR), each camera can be tailored to the application – this maximises the efficacy of this non-destructive and non-invasive measurement technique when mapping active pharmaceutical ingredients.

Analysis **Tablet blister**

- Active Pharmaceutical Ingredients
- Out of specifications



Case Non-destructive and non-invasive monitoring

Problem **Current process analytical technologies are not capable of delivering process quality information for the whole production line in a continuous way with spatially resolved data.**

Solution EVK addresses this issue with its Hyperspectral Imaging System, which targets the entire product stream for real-time inspection, in-situ and 24/7. Parameters such as chemical composition, concentration, distribution or layer thickness can be actively integrated into the PAT system to enable continuous steering and oversight of production. This makes it possible to optimize and speed up production.

Typical applications of EVK

Determination of different parameters in the production line

API concentration, defect tablet blisters
Hyperspectral Imaging and Colour sorting according to customer needs

Concentration measurement in-line (i.e. Active pharmaceutical ingredients)
Quality measurement in-line (i.e. defects in tablet blisters)

Technology Chemical Imaging

Experts in industrial imaging

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