

inno-spec
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THE DARK SIDE OF SORTING POWER

Reliable Detection of Black Materials
with Hyperspectral Imaging

THE DARK SIDE OF SORTING POWER

Every recycling line has a blind spot – the dark side of material detection. Black materials such as plastics absorb most light, making them appear identical to the human eye and “invisible” to conventional sensors.

BlackEye reveals what others miss: reliable identification of black materials, inline and in real time.

The Blind Spot in Recycling

Black plastics and other dark materials pose a double challenge. First, the use of carbon black pigments absorbs light in the visible and much of the infrared range, reducing reflection and rendering objects “invisible” to most cameras and sensors. Second, industrial sorting processes run at high speeds, where small material differences are easily lost.

The consequences are frequent mis-sorting, increased rework, lower purity of fractions, and financial losses.

Traditional countermeasures such as manual re-sorting, additional cleaning steps, or downcycling are costly and undermine sustainability goals.

Without new sensor technologies, this dark side remains a limiting factor for efficiency and circularity in recycling.



**From invisible to
unmistakable.**

SHEDDING LIGHT ON THE DARK SIDE

Why Hyperspectral Imaging?

➔ Spectral precision:

HSI captures full spectra per pixel, making subtle chemical differences visible – even in black materials

➔ Pixel-based classification:

Each pixel contains data for robust material identification.

➔ Real-time capability:

High frame rates enable seamless integration into fast-moving industrial sorting lines.

➔ With **BlackEye Gen 2**, the optional extension up to 5.0 μm provides the decisive USP: only in this range do carbon black and many other dark materials reveal distinctive spectral features.



FROM DARKNESS TO CLARITY

BlackEye in Action

BlackEye is one of the very few hyperspectral cameras capable of reliably classifying black plastics and other dark materials. It transforms what has long been considered the “unsolvable problem” into a practical solution.

- ➔ Inline quality control ensures stable sorting without manual intervention.
- ➔ Real-time detection enables higher throughput and cleaner fractions.
- ➔ Reliable results reduce costs and increase overall system efficiency.



By closing the detection gap, **BlackEye** helps recycling operators and industrial users unlock new value from existing processes – moving from guesswork to certainty.

BlackEye turns the industry's toughest challenge into a practical solution: the reliable classification of black materials.

By combining advanced optics with embedded hardware, it delivers stable, real-time classification – reducing errors, increasing yield, and ensuring cleaner material streams. In action, **BlackEye** makes the invisible not only visible, but valuable.

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Real-time sorting,
zero guesswork.



Accurate and reliable sorting is essential for achieving high recycling rates.



Looks all the same? BlackEye identifies the unique chemical fingerprint of each flake.

Applications Across Industries

Black materials are not confined to plastics alone – they occur across multiple industries, from textiles to research. Wherever dark substances need to be identified and separated, conventional sensors quickly reach their limits.

BlackEye opens new possibilities: by revealing spectral differences that remain hidden to other systems, it enables accurate detection and classification of dark materials across diverse applications – from recycling lines to research laboratories.

- ➔ **Textile recycling:** distinguish black polyester or blends
- ➔ **Plastics recycling:** PE, PP, ABS – despite black pigmentation
- ➔ **General QA:** inline control of material flows

How BlackEye Works

BlackEye uses MWIR hyperspectral imaging with an extended spectral range:

- ➔ Spectral range: 2.9–4.2 μm , optional up to 5.0 μm
- ➔ Spatial resolution: 640 pixels (vs. 320 px in Gen 1)
- ➔ Frame rate: up to 520 fps (vs. 380 fps)
- ➔ Optical design: Improved thermal drift resistance, lower smile & keystone distortion
- ➔ Reliability: Cooler MTBF up to 28,000 h (vs. 8,000 h)
- ➔ Embedded hardware: Ready for direct integration into industrial systems

This combination ensures robustness, precision, and industrial scalability.

THE POWER OF SEEING DIFFERENTLY

With **BlackEye**, what once remained hidden becomes actionable. By combining hyperspectral precision in the MWIR range with robust embedded hardware, **BlackEye** not only closes the blind spot of black material detection – it transforms it into measurable efficiency, higher yields, and cleaner processes. This is more than a technical innovation: it is a practical tool that empowers industries and research alike to unlock new value and move closer to a truly circular economy.

Turning the Dark Side into Your Advantage – Benefits at a Glance:

- ➔ Reliable detection of black materials
- ➔ Increase throughput and yield
- ➔ Inline, real-time analysis
- ➔ Support circular economy goals
- ➔ Reduce manual rework and costs

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Not a galaxy
far away –
it's your
recycling line.



The unseen is waiting. **Reveal it with BlackEye.**

Contact us now.

Download further resources,
send us your samples,
or contact our team at
seethroughblack.de



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