Case study

Transforming waste management with AI-enabled decision making

softeta

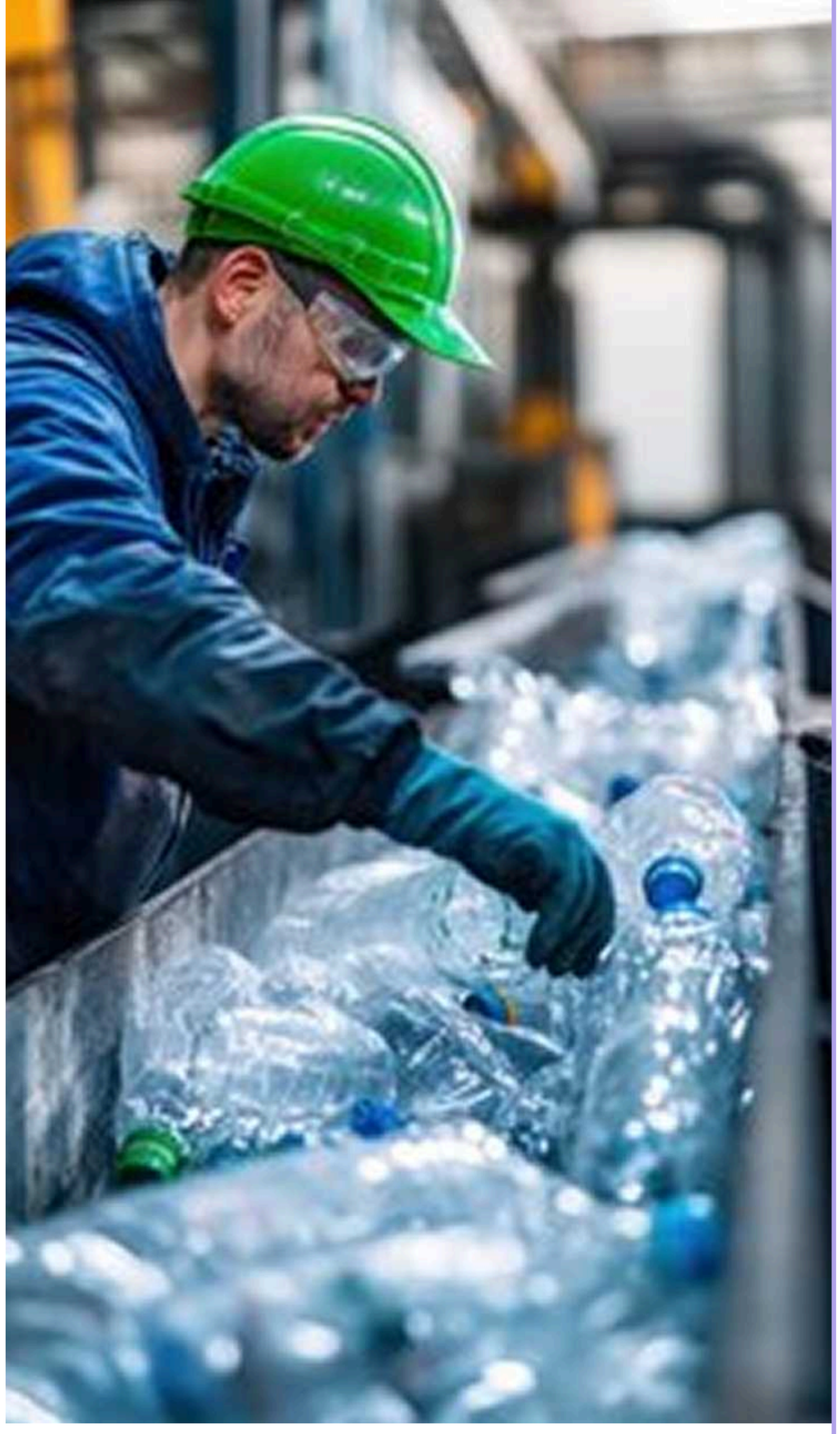
Client profile

Client: Energesman operates the Mechanical and Biological Treatment (MBT) plant for the capital of Lithuania – Vilnius region, handling over **220,000 tons** of municipal waste each year from **8 municipalities**.

Industry: Waste management
Location: Vilnius, Lithuania

Softeta's expertise:

- Artificial Intelligence
- Computer vision
- Cloud deployment



Challenge:

Waste morphology inaccuracy

Our client has always been committed to building a more sustainable future. With significant investments going into circular economy and recycling initiatives, they understood the importance of data-driven decision-making. Like many in the industry, they relied on periodic waste sampling of four times a year to guide these efforts.

Over time, they began to notice a disconnect. Some projects weren't delivering the expected results, and the data didn't quite match what they were seeing on the ground.

Key insight:

Waste composition variety

Rather than continue on assumptions, the team decided to take a closer look. What they discovered was a key insight: while traditional sampling methods offered a starting point, they didn't capture the full picture.

Waste composition could vary significantly, and small sample sizes weren't enough to reflect those changes accurately.

That realization led to a new approach.

Softeta’s Solution

AI-powered computer vision system

The client decided to embrace an AI-powered waste monitoring and management system, which could analyze the entire waste stream in real time.

Energesman turned to Softeta to design and implement an advanced, AI-powered solution for real-time waste detection and classification built from the ground up with their unique operational needs in mind.

Key capabilities delivered:

- Automatic detection and counting of 6+ waste categories, with ongoing expansion
- Real-time video processing from 3 conveyor belts simultaneously
- Actionable analytics and anomaly alerts to inform operational decisions instantly

Results:

Softeta’s solution delivered strategic value for Energesman, transforming operations with AI:

- Significant reduction in manual labor and sorting errors
- Real-time insights that empower faster, smarter decisions
- Improved regulatory compliance through transparent, accurate data
- A strong foundation for future autonomous sorting systems which are now in progress

Impact

With this shift, our client gained a much clearer understanding of what’s really happening with the waste they collect, allowing them to allocate investments more strategically and maximize the impact of their sustainability efforts.

Thanks to this innovative step, they are now better positioned to meet national sustainability goals and lead with confidence in a rapidly evolving environmental landscape.

Softeta’s Solution

Implementation steps

Data collection
First, Softeta collected data from high-resolution industrial cameras across Energesman’s sorting lines, collecting diverse visual data under varying lighting and motion conditions. This foundational phase shaped the entire success of the project.

Primary mission
To create a dataset that accurately represents the challenging conditions of industrial sorting lines.

Key challenge
Detecting waste effectively in a cluttered and constantly moving environment.

Importance of dataset quality
Recognized that the success of the AI project heavily depends on the quality of the dataset.

Data collection

- Invested significant time in curating a high-quality dataset.
- Used footage from livestream cameras installed in the actual factory setting.

Dataset customization

Developed a custom dataset tailored specifically for the waste detection solution.

- Collected 10 000 of video samples.
- Ensured the dataset supports accurate object detection within video frames.

Softeta's Solution

Implementation steps

Data annotation

After data collection, an equally important phase in dataset development begins: labeling. Every sample we create must have an associated label. For object detection tasks, this means assigning a bounding box and specifying the object type. We labeled multiple waste categories, such as:

- Plastics: PP, LDPE, Other
- Containers: Alcohol bottles, Glass jars, Tetrapaks, Champagne bottles
- Bags: Orange municipal collection bags

This labeled information is fed into the model alongside the corresponding samples, and it is critical that the bounding boxes are accurate. The model relies on this precision to learn how to correctly identify and locate objects.

Once the data was collected, we meticulously reviewed all the samples to ensure that the images used for training were of high quality. This was a particularly time-consuming process, given the large volume of data (~75 000 images) required for effective model training.

AI solution in action

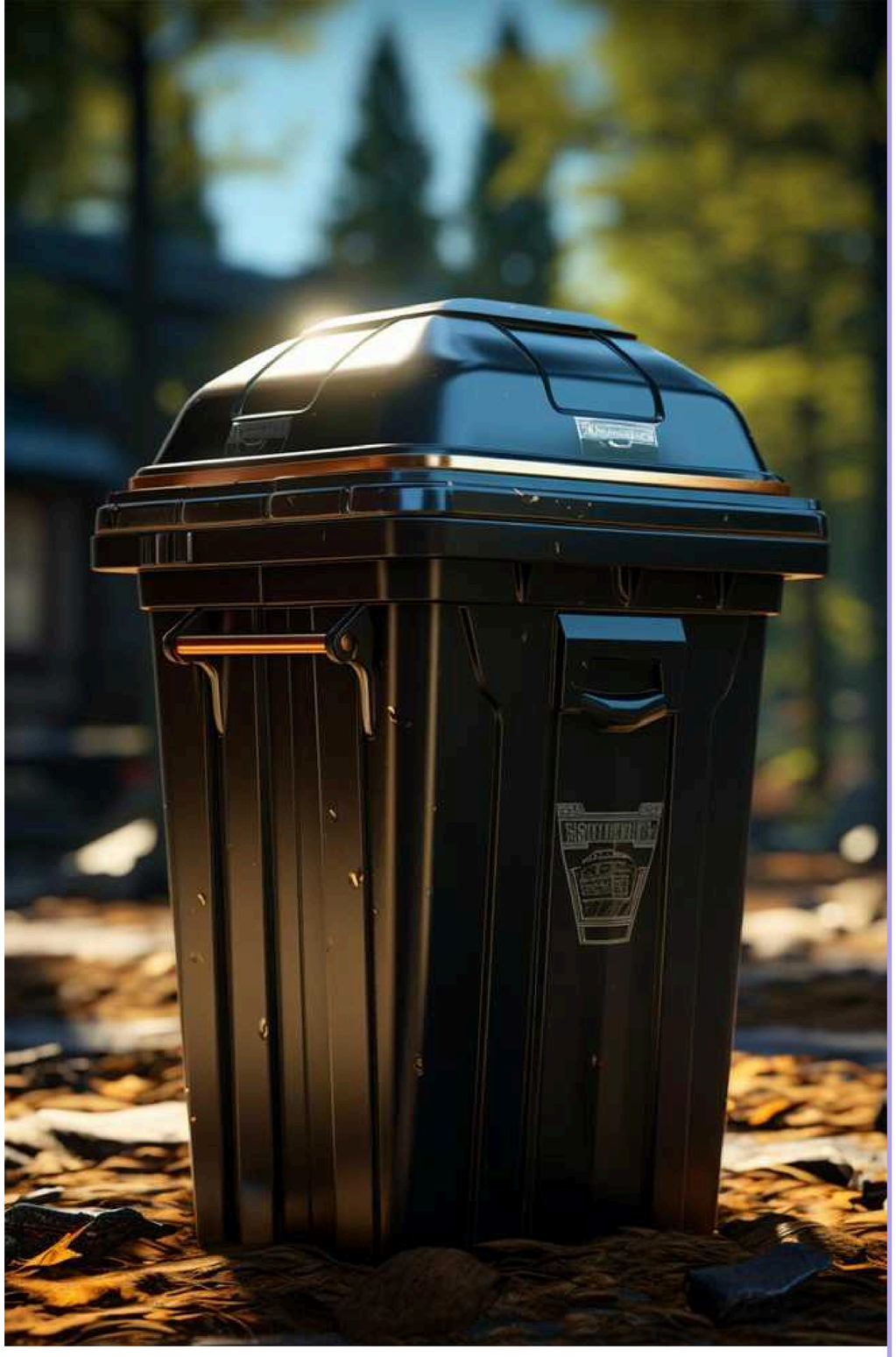
Softeta's Solution

Implementation steps

Model development & evaluation

Using state-of-the-art deep learning techniques, our team trained object detection models optimized through advanced metrics. Then Softeta validated model performance through:

- F1-Confidence curves for threshold tuning
- Normalized confusion matrices to identify misclassifications
- Visual inspections on real plant data to ensure accuracy in real-world scenarios



Deployment on the cloud

Softeta deployed the solution on cloud, flexible for future development and necessary integrations. The system was fully integrated into Energesman's facility, offering:

- Real-time detection feedback
- Live object counting
- Anomaly alerts for non-conforming items

Tech stack

python™

OpenCV

docker

PostgreSQL

PyTorch

FastAPI

What's next

Softeta's AI solution is now ready to be integrated into Energesman's upcoming robotic waste sorting system. This integration will help reduce the need for manual labor and minimize sorting and recycling errors caused by human limitations and workforce shortages.

Looking ahead, Energesman plans to expand the use of AI even further. With the new data collected, they aim to work more closely with the private sector by providing valuable market insights related to their business segment.

Our solutions

AI and process automation

System modernization and optimization

Custom software systems

Client testimonial

“Softeta brought a perfect blend of technical depth and practical implementation expertise. From model training to edge deployment, we provided a seamless, end-to-end AI engineering service tailored to the demands of industrial waste management.”

—Algirdas Blazgys, CEO at Energsman.

Let’s build your AI-powered future!

Whether you’re optimizing manufacturing, logistics, or environmental operations, Softeta delivers B2B AI solutions that perform. Contact us today to learn how we can transform your business with intelligent automation:

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Let’s work together

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