



TOMRA LEADS
eBOOK

DIGITALIZATION

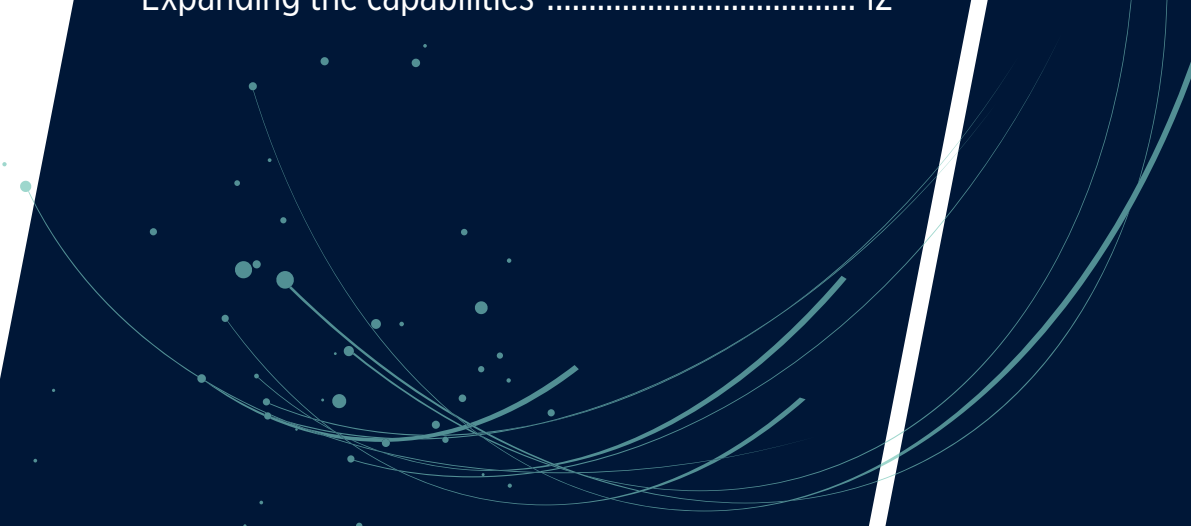
Connect to Enhance Productivity in the Recycling Industry





CONTENT

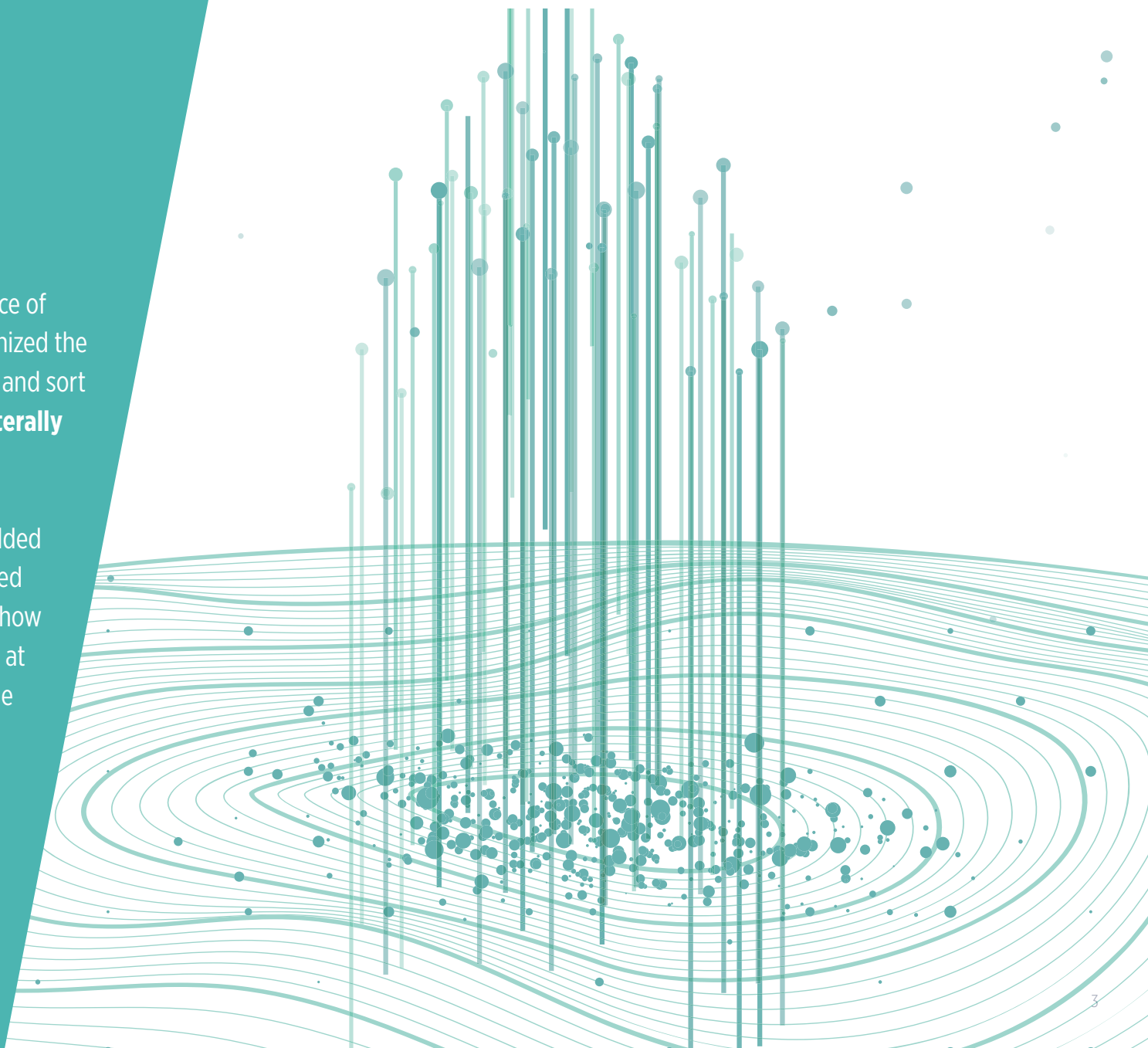
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FOREWORD

We live in the age of connectivity. The emergence of computer networking and the internet revolutionized the way we capture and store data, track inventories and sort recyclable materials. **A world of information is literally at our fingertips.**

At the onset of the 4th Industrial Revolution, embedded sensors in machines capture data that can be analyzed for action. Cloud-based data storage is transforming how we access and review this data, with quick connection at the office via the computer or in the field using a mobile device.



FACT-BASED DECISIONS ALLOW FOR PROCESS OPTIMIZATION

Assuming 6,000 sorters process an average of 5 t/h, 12 h/day. With a productivity rate increase of at least 1%, based on the interpretation of data visualizations and analysis, an additional 1.3 million tons of products are processed annually.

Leveraging quantifiable information on the process performance and product quality obtained from the connected sorters will allow for fact-based decisions to optimize the overall productivity of the machines and the process.

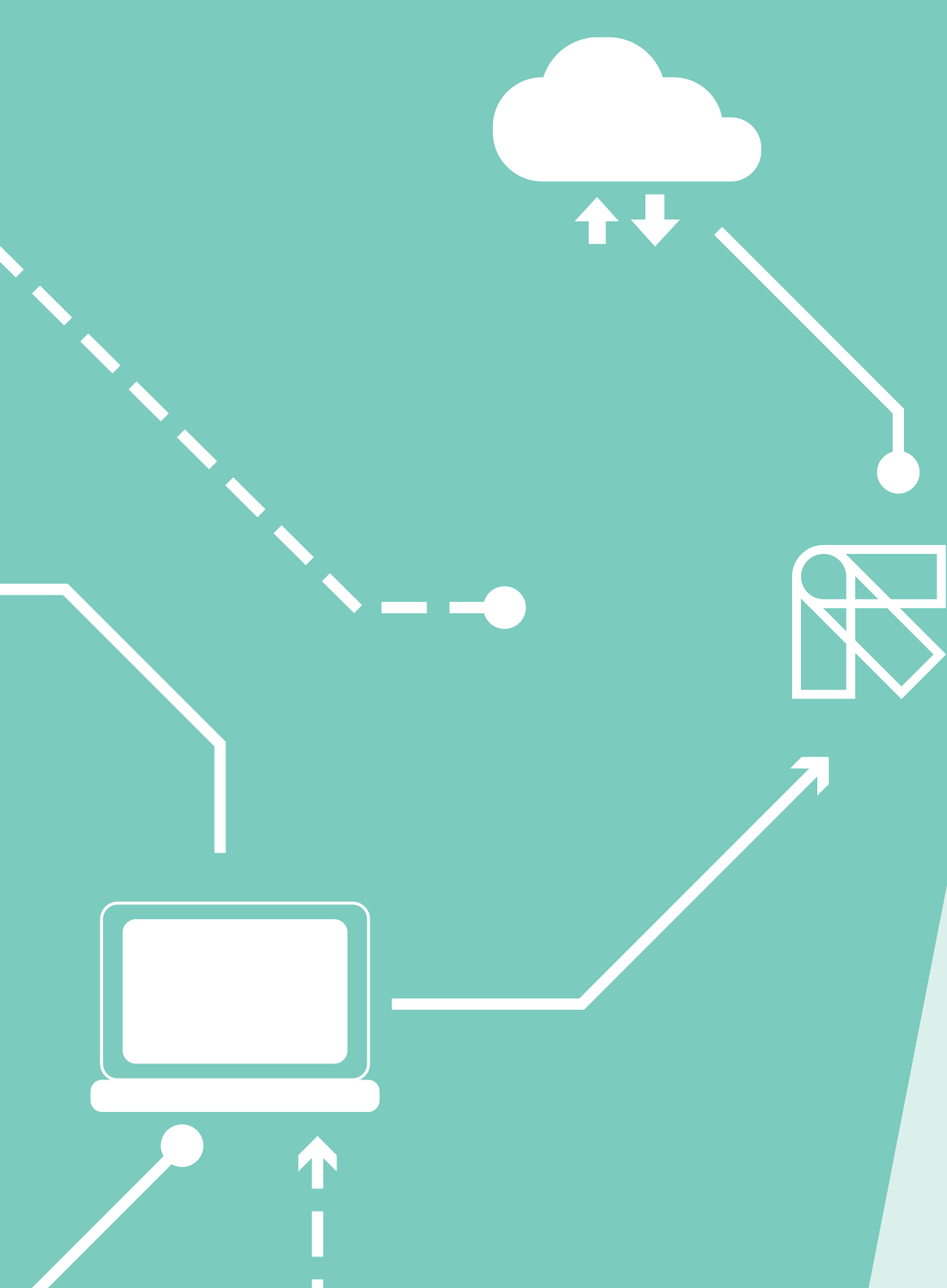
6,000
active sorters

5 tons/h
per sorter
12 h/day

1%
productivity increase

1.3 m tons
more on a yearly basis

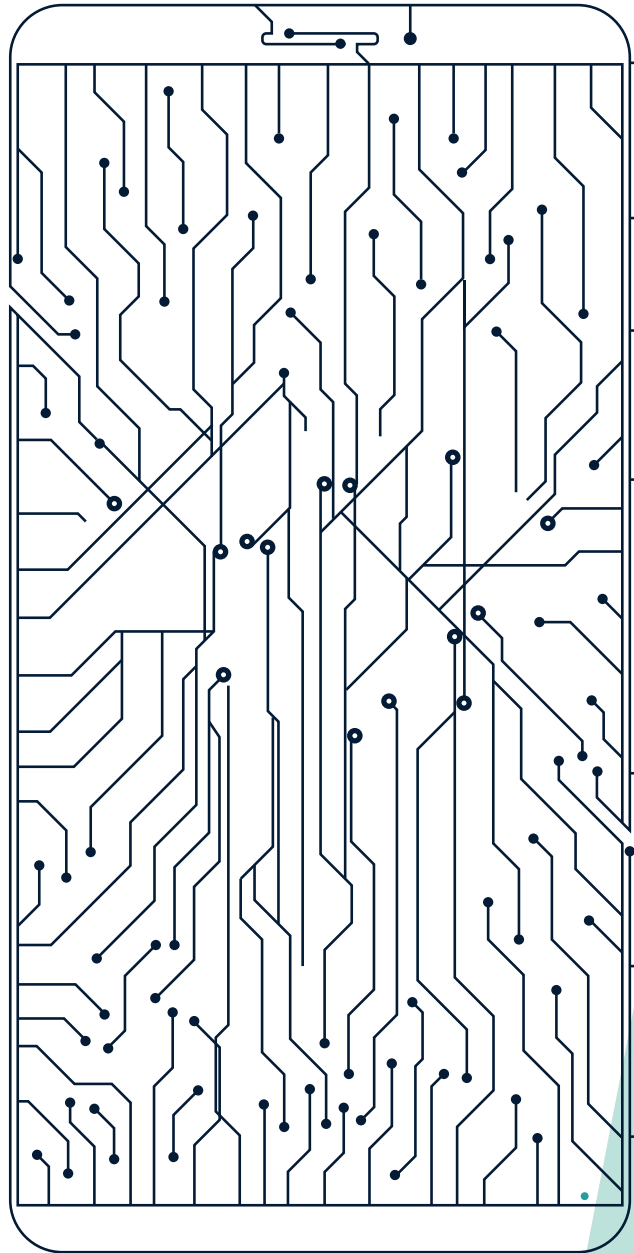




CONNECTIVITY IN THE INDUSTRY

The recycling industry is at the advent of discovering the power of data collected from connected optical sorting equipment, ushering in a **new era of data-driven process optimization**. The foundation now exists for future advances in sorting capabilities with today's connected machines. Further advancements through **deep learning** for image recognition hold the potential for sorting material once thought unrecoverable.

Recyclers large and small who embrace digital machine connectivity have access to near **real-time** operating data, offering deeper production insights for making fact-based sorting decisions. Those at the forefront of today's sorting technology revolution are using these machines to their full potential to achieve higher sorting efficiencies and availability, giving them the competitive edge.



1 active sorter // connected to the Internet // sends data to the system

2 data is processed and visualized on the web-portal


3 notification as set-up by the user // or user consults data pro-actively

4 **information available:**
// sorter status
// tons of products sorted
// service interventions
// product composition
// documentation

5 based on the information the user takes fact-based decisions

6 operator adjusts sorting program & settings

7 both historical and live data are available on the platform



**When facing tomorrow's
business challenges, together
we are stronger. That is why this
is the time to connect.**

*Volker Rehrmann, EVP,
Head of TOMRA Recycling/Mining & Circular Economy*

THE CLOUD SOLUTION

Prior to optical sorting connectivity, gathering production data proved difficult. Detailed information remained local to the machine and could only be gathered by workers tied to the unit. Harvested data was not reported as charts or graphs, so typically operators developed their own reporting systems to review post-production data.

Today's digitalization turns **optical sorters into connected devices** that deliver easily accessible production data. Optical sensors collect processing data such as sorting throughput and machine statistics, while also providing service alerts. Production details are enriched with **service reports, spare parts orders and product manuals**, giving operators all the necessary information for operating and maintaining the equipment. Rather than going to the machine to capture this data, key personnel remotely connect via a secure internet connection from the office, home, or field. Workers access production information on mobile devices or computers to see if target material compositions and production rates are being met. They can quickly visualize and address production disruptions. No longer is this data stored at the optical sorting machine. **Historical production graphs** for all the company's connected sorters are now remotely accessed, allowing for deeper analysis and comparison of different machines, lines, and plants.

EMBRACING THE REVOLUTION

The world is in the mist of the **4th Industrial Revolution. Industry 4.0** and the **Industrial Internet of Things (IIoT)**, where factories have equipment augmented with sensors and connectivity, provide reporting through a system that allows for visualization of the entire production line. Today's **optical sorters are**

data delivery machines to drive the strategic management process. Capturing sorting data delivers actionable information to make fact-based decisions. For example, material composition charts offer detailed overviews of process throughput rates for different types of sorted material like waste, plastics, paper, or metals.

Near real-time data provides insight into production gaps, so analysis can be made into potential root causes. This level of detailed information allows companies to **react faster to change**, improve recycled product quality and maximize throughput.

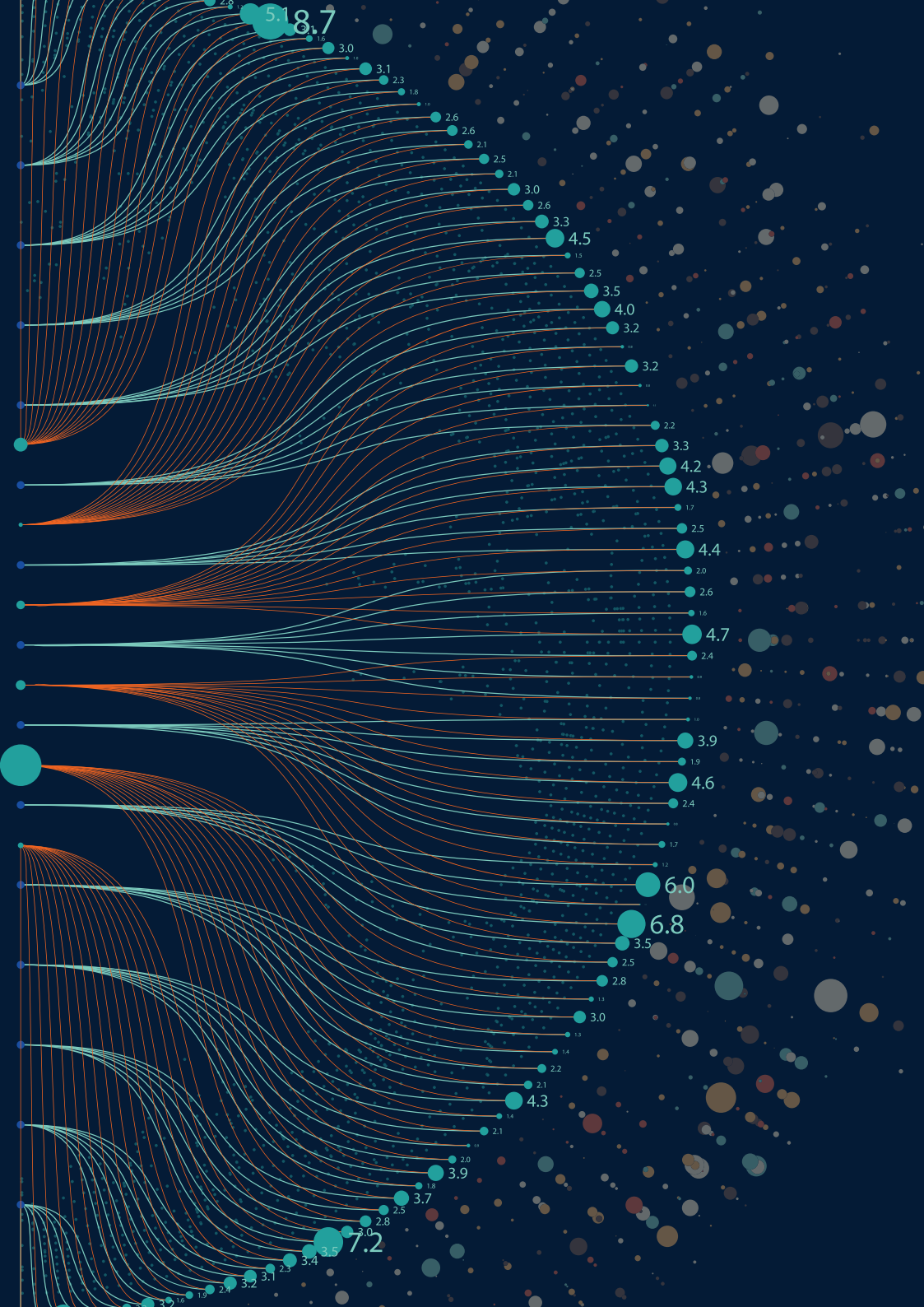


Connected equipment also simplifies machine maintenance and service to reduce operating costs. Machine alerts notify key designated personnel to potential machine issues or when scheduled maintenance is due.

Service technicians can remotely access machine data to troubleshoot problems. If a part is needed, **online manuals** and **spare parts order histories**

simplify the ordering process to optimize machine uptime. With service records accessible in the same location as production and process data, operators can analyze a machine's **service history** and map it to the sorting performance. This leads to informed decisions for adjusting maintenance procedures or determining when it's the right time to upgrade the asset.





SECURE DIGITAL LOCKBOX

In today's virtual world, securing data is paramount for all businesses. The recycling industry is no exception, especially when it comes to **processing data**. Operators want to be assured that their machine reporting data remains theirs.

Secure data storage. Secure analysis. Secure connections and visualization. At the heart of sorting equipment digital data mining and reporting lies an airtight cloud-based storage platform. User-friendly connections and interfaces deliver user- and role-based customized reporting, so **workers only receive the data pertinent to their role within the company**. These digital data reporting systems are developed in close collaboration with leading technology partners to deliver cloud-based technologies that respect the recycling operator's privacy requirements. Digital data is locked behind **protected virtual walls**, and these secured chambers are continually tested to ensure impenetrability.

EXPANDING THE CAPABILITIES

Starting with cloud-based technologies built on data privacy and security at its foundation, Industry 4.0, IIoT and connectivity are **reshaping the recycling industry**, ushering in a new wave of innovation for today and tomorrow.

Working in close collaboration between supplier and customer, these scalable platforms are delivering the data that allows operators to take **proactive versus reactive measures** for items like production optimization and equipment maintenance. In the future, large groups of **digitally connected machines will communicate** and report production data across the globe. Leveraging collected data and advanced analytics, new sorting technologies and processes will be developed to improve sorting efficiency and boost final product purity. Connected machines will combine massive quantities of data with machine learning to one day allow for self-optimization of the sort, based on material recognition. Optical sorters will communicate with other components to optimize the entire line's sorting efficiency and tackle difficult sorting tasks too complicated for current industry-standard techniques.

Service technicians will expand remote response for diagnosing and troubleshooting connected equipment. **Software updates** will be made remotely to connected sorters at times that do not negatively impact the production schedule. Machines will **self-diagnose maintenance issues** and preorder replacement parts or service to **minimize downtime**. These scalable digital solutions for sorting equipment hold much promise for the future of the recycling industry and for those companies willing to embrace it.

Join us on this exciting journey into the future: <https://insight.tomra.com/en>



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