

OreGate

Elemental Analysis system
for FeCr



OREGATE - IMPROVED PROCESS CONTROL AND GREATER END PRODUCT QUALITY

Steel mills need methods for determining the accurate elemental composition of material flows in real time. As a consequence the process is subject to process fluctuations and inconsistent end product quality and value. The inconsistency translates into loss in profits, energy and complications in operation.

OreGate elemental analysis enables FeCr furnace operator to stabilize the elemental composition of the raw material mixture and optimize the process for greater quality. Stable operation of the furnace also mitigates number of problems in operating the furnace.

OreGate provides real time feedback on raw material elemental composition. This is achieved by analysing 100% of the material flow by neutron activation analysis. No sampling is needed. With OreGate online measurement, the plant operators can immediately react on any changes in raw material elemental composition.

BENEFITS OF OREGATE

HIGHER QUALITY OF THE END-PRODUCT

- Accurate data of the elemental composition of the whole raw material volume.
- Adjust raw material feed during process.
- Optimize and stabilize the elemental concentrations in the raw material feed.

IMPROVED PROCESS CONTROL

- Enable real time process control and data based decisions.
- Stabilize the process fluctuations and eliminate problematic behavior of the furnace.
- Less shutdowns and malfunctions.

SAVINGS IN ENERGY, RAW MATERIAL AND CO2

- Lower and more stabilized operating temperature of the furnace.
- Optimal mixture of raw material content used.
- Lower emissions.





NEXT GENERATION ELEMENTAL ANALYSIS

CUTTING EDGE TECHNOLOGY

OreGate uses a technique called Prompt Gamma Neutron Activation Analysis (PGNAA) to measure elemental composition of the material flow. With PGNAA, material is irradiated with neutrons exciting it, while the relaxation of that state results in a gamma response of the irradiated material. The response is characteristic to the elemental composition of the material, providing accurate means to measure the elemental composition of the whole material flow volume.

HIGHLY VERSATILE AND TAILORED

OreGate has a very high rate of versatility. As our technology interact on full sample volume and on nuclear level, measurement of heterogenous and non-uniform material is possible. Through the use of the NAA method our product can measure almost any liquid or solid materials. OreGate products can be placed in almost any industrial environment. Our solutions are always tailormade by our technical team to meet our customers' needs and their specific environment.

NON-INVASIVE AND EASY TO INTEGRATE

OreGate is non-invasive and can be installed on existing conveyor belt environment. Modular design allows setting up required components to gain maximum effectiveness while maintaining cost control. The modular design makes the products easy to integrate on existing process pipeline, conveyorbelt, silo or laboratory with minimum alterations.

ENERGY EFFICIENT AND GREENSOLUTION

Lower and more stabilized operating temperature of the furnace result in lower emissions. OreGate helps our customers in their push for greener and environment friendly operations.

SUMMARY

ACCURATE DATA (*COMPREHENSIVE VS. PARTIAL*)

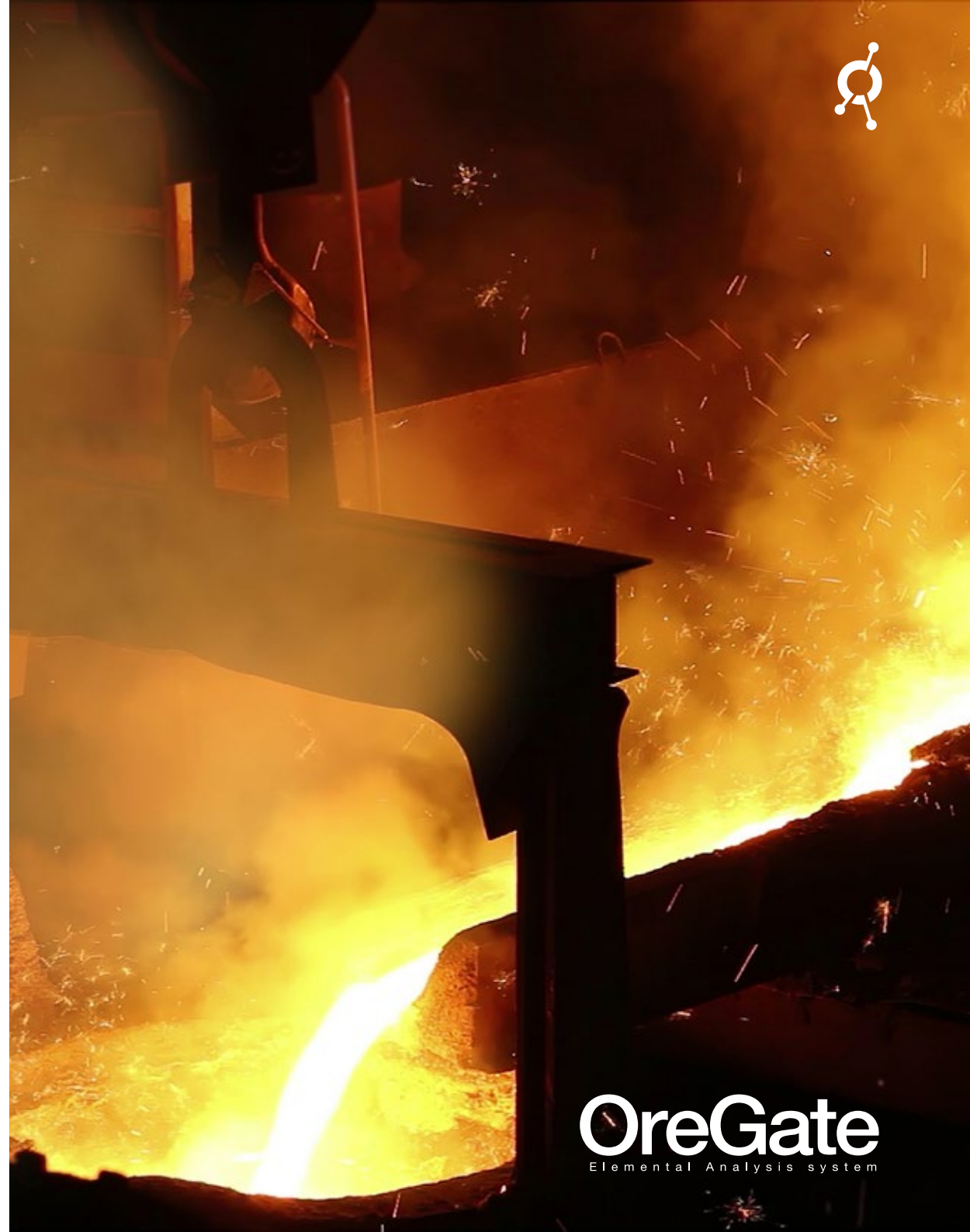
The exceptional characteristic of OreGate® is that it yields accurate data of the elemental composition of the whole raw material volume rather than just small portion of it.

TIMELY DATA (*BEFORE VS. AFTER*)

Since OreGate is installed on the conveyor belt before the furnace, the operator has time to react on any changes in raw material feed. Anomalies in raw material composition can be detected in seconds.

OPTIMIZED PROCESS (*PROACTIVE VS. REACTIVE*)

The comprehensive data of the whole material flow and timing of that data gives our customers chance to optimize their raw material mixture. This comes with manifold benefits such as improved process control and data based decisions, less shut-downs and malfunctions, consistent and higher end product quality, minimized emissions and waste.

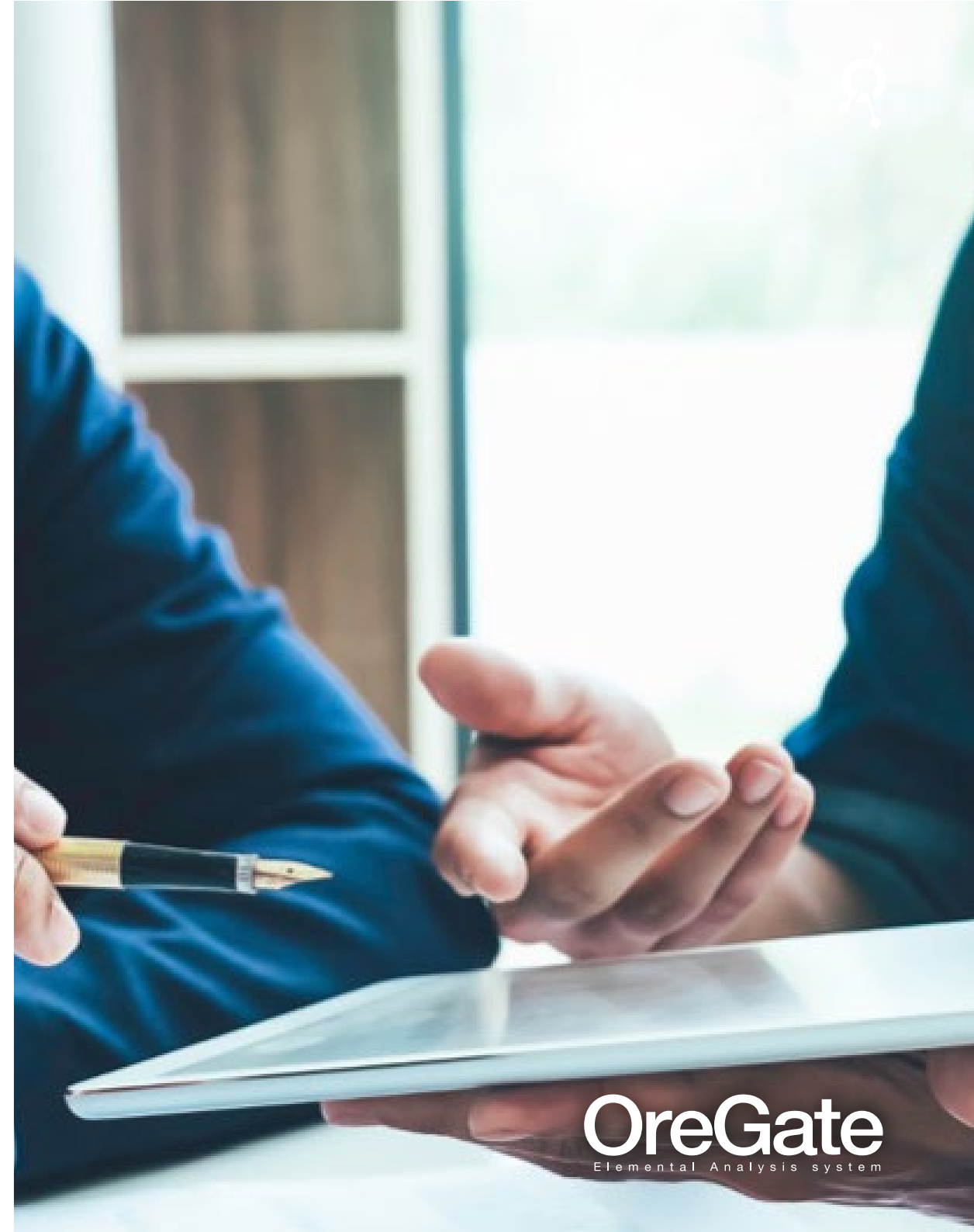


FIVE STEPS TO FIGURE OUT IF OREGATE CAN BENEFIT YOUR BUSINESS?

NOTHING TALKS LIKE DATA. THERE IS A CONVENIENT AND STRAIGHTFORWARD WAY TO FIGURE OUT HOW WE CAN BENEFIT YOUR BUSINESS.

1. Fill the application questionnaire asking basic information on your sample and application.
2. Place purchase order for sample analysis and send us your sample.
3. After performing the analysis in our facilities, we can provide you with detailed measurement results that will serve as basis for performance guarantee.
4. We can together build tailored system that meets your application requirements.
5. After presenting our tailored solution we will present a deal for equipment purchase and service contract.

Note: Our contract offer includes care free maintenance and the commitment of our professionals to develop the analysis for your process optimization.



Illustrated drawing of the machine on a conveyor belt

NEUTRON SOURCE:

Electrical neutron source based on low energy particle accelerator producing neutrons via nuclear fusion reaction. Mainly via $d(d,n)He$, $d(Li,n)Be$ fusion reactions. Advantages are safety, pulsed operation and high neutron yield.

AUXILIARY SYSTEMS:

Contain all the electronics and coolers in order to control and power the OreGate system. (Separate unit.)

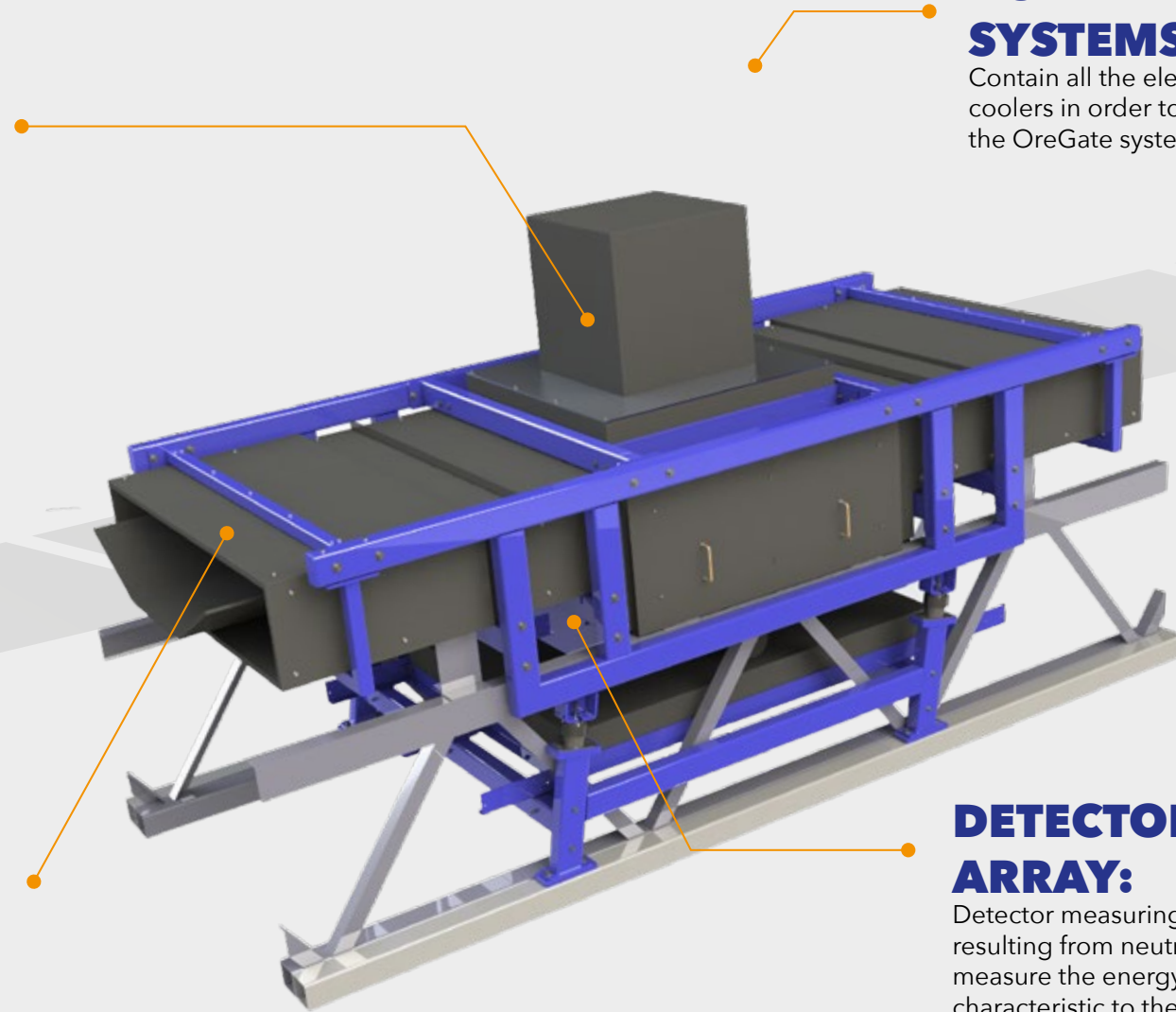
RADIATION SHIELDING:

In OreGate configuration Radiation shielding surrounds the conveyor belt and raw material. FeCr patch is irradiated from top and gamma signal is detected from below or on top of the belt.

DETECTOR ARRAY:

Detector measuring the gamma radiation resulting from neutron irradiation. Detectors measure the energy spectrum which is characteristic to the elemental composition of material flow. Neutron detectors stabilize the neutron production.

OreGate
ELEMENTAL ANALYSIS SYSTEM



Key parameters of the OreGate EAS system:

2022

NEUTRON GENERATOR	UNIT/NOTE	MIN	MAX
Generator model	nJenni-DLi-2E9		
Maximum time averaged neutron production yield	n/s		2E9
Neutron production reaction	d(Li,n)Be, d(Li,n+a) and d(d,n)He		
Neutron Energy	Thermal, 0-8MeV continuum, 2.5MeV, 13MeV		

DETECTOR ARRAY	UNIT/NOTE
HPGe Detector	30-40% cryo cooled Germanium detector. High resolution gamma spectrometer
BGO detectors	2 5"x5" BGO detectors for high energy gamma counting.
B10 detector	Neutron detector for neutron production stabilization.

REGULATION	
USER INTERFACE	UNIT/NOTE
Radiation safety	Public exposure class: E
	Occupational exposure class: 3
	Radiation security class: Unclassified or C
Compliance	CE marking requirements. LVD, MD, EMC, EURATOM

ELECTRICAL	UNIT/NOTE
Power	400VAC 3x230 VAC 32A
Communication interface	Analog, Ethernet, Profibus, Modbus, Custom
Interlocks and binary signals	24V isolated relays. Interlocks, hard Errors
Detector DAQ	Detector data acquisition module

MASS AND DIMENSIONS	UNIT/NOTE	MIN	MAX
Total mass without custom radiation shielding	kg / Includes: neutron Source, detector array and auxiliary systems; Excludes: radiation shielding	600	1000
Mass installed on conveyor frame	kg / Includes: neutron source, radiation shielding and detector array; Excludes: auxiliary systems	2000	3500
Dimensions	Measurement system; m / Depends on productionline dimensions (Radiation shield, neutron source, detector array) ; 2x2x1.2	Rack; cm; 80x100x180 Chiller	

MEASUREMENT REPEATABILITY IN 30 MIN RUNNING AVERAGE		
ELEMENT	MEASUREMENT RANGE [MASS-%]	UNCERTAINTY [MASS-%]
Fe	8-20	<0.2
Cr	10-30	<0.3
C	8- 20	<0.02
Si	5-10	<0.1%
H	0.03-0.1	<0.001



OUR STORY

NeutronGate is a Finnish company founded in 2014 by Hannes Vainionpää. From a childhood Hannes has had a passion to understand what makes the world tick. When finishing his Master's degree in physics at the University of Jyväskylä, Hannes became interested with fusion and plasma technologies.

After furthering his studies at Berkeley National Laboratories and working in Silicon Valley, Hannes saw that there is room for improvement when it comes to the existing methods of industrial measurement. The passion to utilize neutron activations in industrial processes led Hannes to start NeutronGate. While the use of neutron activation is not new, Hannes with the team of NeutronGate professionals was able to take the game to a completely different level. The uniqueness of NeutronGate is in its superior technical performance and very high level of adjustability. Our products and services can be set up to almost any industrial environment, yielding exceptionally accurate results in real time. It is no wonder Outokumpu has chosen OreGate for their Tornio ferrochrome site.

OreGate has now taken steps to become a global and reliable partner for companies across industries that manage material flows. The company's growing team has adopted the values of our founder: always challenge the status quo, commitment to extreme honesty, nothing talks like data.

Picture: Hannes Vainionpää Founder & CEO of NeutronGate