

**Everyone online!
Everything wireless?**



Overzicht

- Wie is Peter
- Wie is Nouryon en wat maken wij
- Wat zijn kenmerken van onze chemische industrie
 - Continuïteit
 - Veiligheid
- Waar kan 5G een rol spelen
 - Buiten de poort
 - Binnen de poort: op ons terrein, opslag en in de fabriek
 - Connected medewerker
- Conclusie

Nouryon facts and figures



About **10,000**
employees worldwide



Operating in over
80 countries



More than
5,000 patents



Almost **50% renewable**
energy use



€5 billion in
annual revenues



Almost **400 years**
of experience



€100 million annual
R&D investment



> 45% of products have
sustainability benefits

The markets we serve



Paints, coatings
and construction



Agriculture



Pulp and paper



Cleaning and
personal care



Water treatment



Polymer
production
and processing



Oil and gas



Electronics



Food

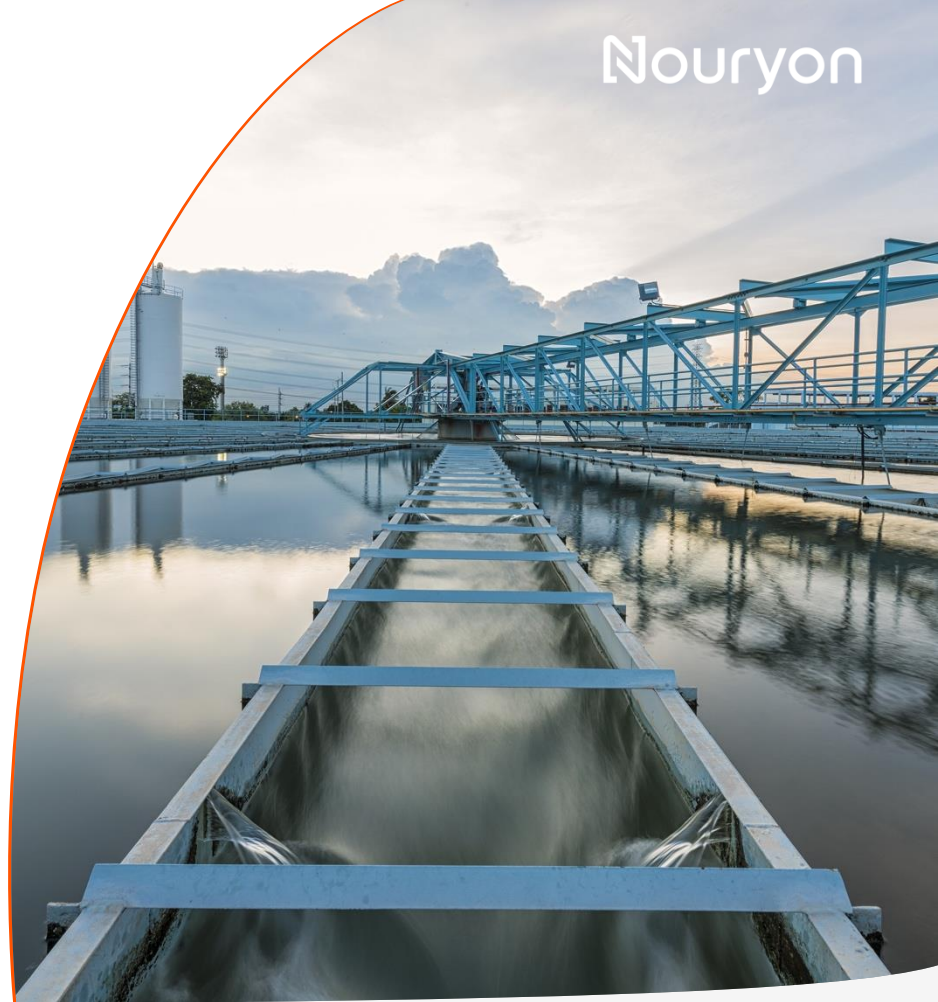


and many more...

Water treatment

Taking care of waste water from process streams and making sure water is clean and safe to drink

- Iron chloride
- Sodium hypochlorite
- Scale and corrosion inhibitors
- Hydrogen peroxide
- Ethylene amines
- Levasil colloidal silica



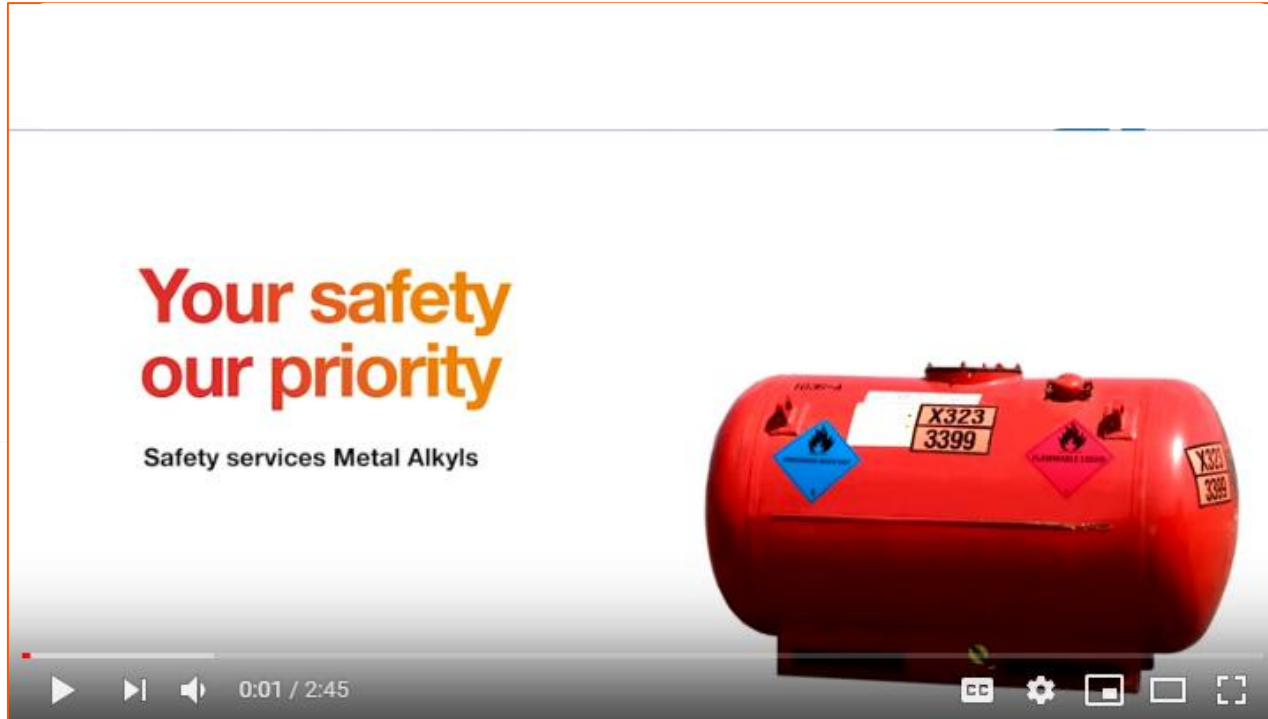
Electronics

Key ingredients for the production of semiconductors and applications such as solar cells, LEDs, and smartphones

- High purity metal organics (HPMO)
- Levasil colloidal silica
- Specialty polymers
- Dissolvine chelating agents
- Sodium chlorate specialty applications







**Your safety
our priority**

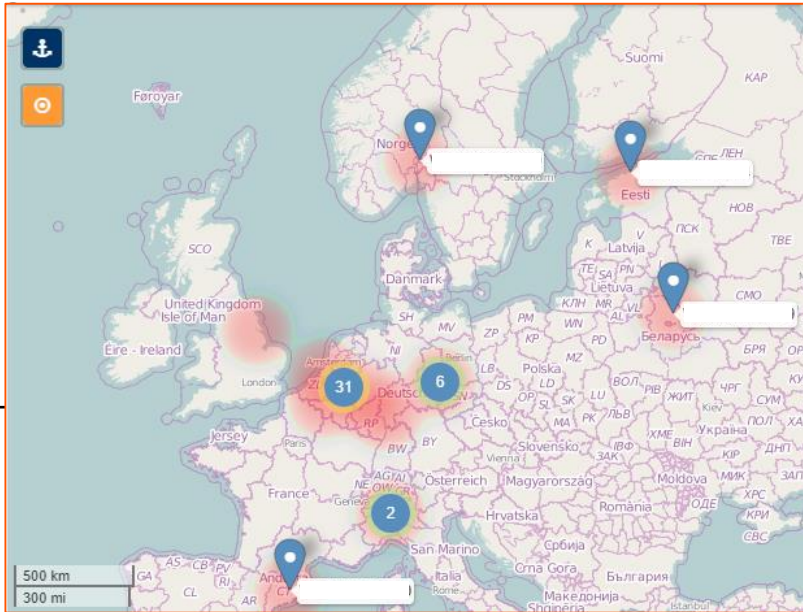
Safety services Metal Alkyls



<https://www.youtube.com/watch?v=IEZDbFpzafo&t=3s>

Wireless area's of interest

Outside the fence



Inside the fence



Track & Trace program

Known location
anywhere on the planet



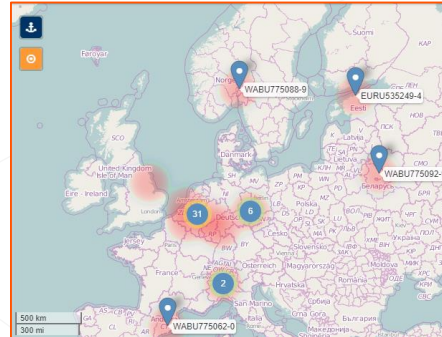
Near **realtime**
status information



Major TC/RTC
fleets monitored

Temperature control
improved **safety**

Delivery status information
available for customers



Asset **maintenance**
scheduling

Unplanned stationary
asset **notification**

Provide evidence for
detention calculator

Multimodal overview
truck, train, sea or plane

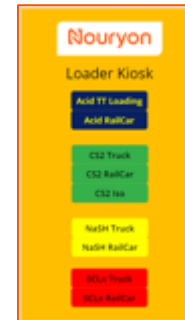
Stock management

Early / late truck
arrival notification

Inbound delivery
registration

PowerApp
Loader support

Accurate warehouse
overview



Spare part
Management

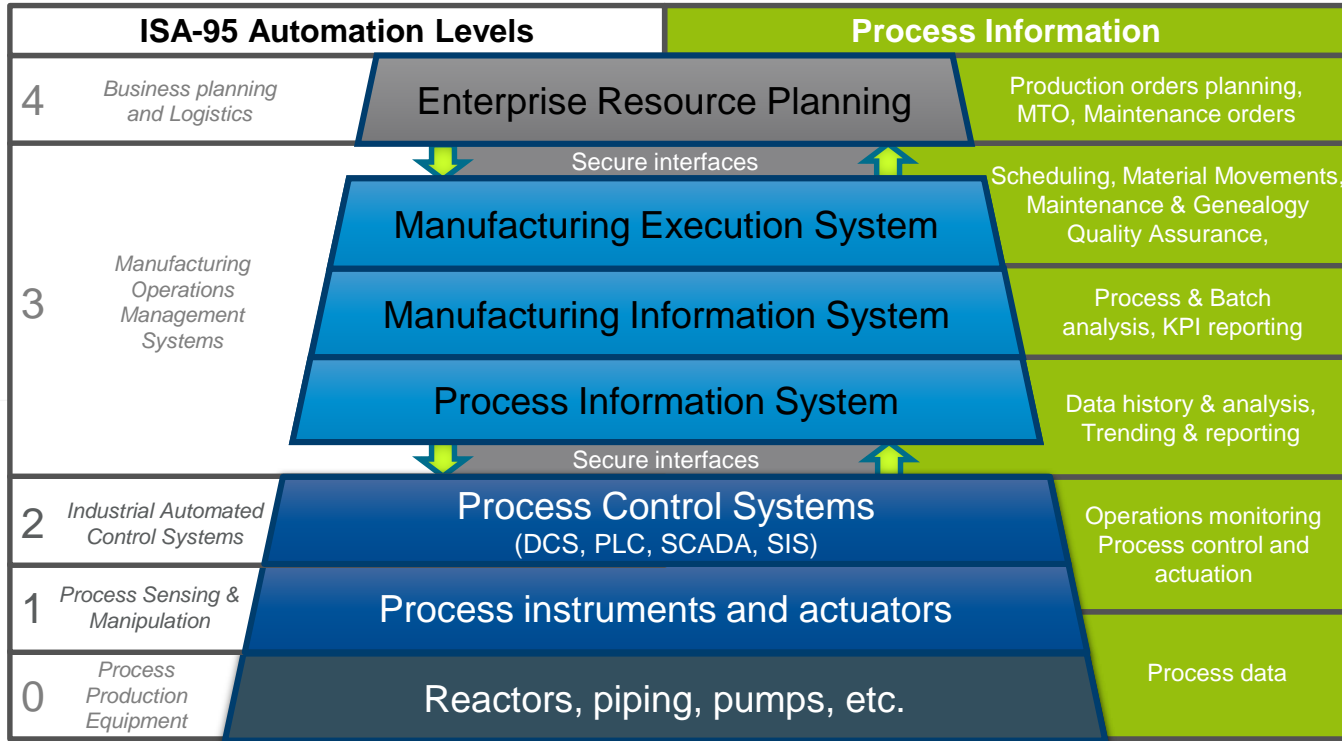
Barcoding stock
for easy tracking

Account for internal
stock movements

GFM integration
tracking bubblers

Outbound delivery
including picking

Factory sensorisation

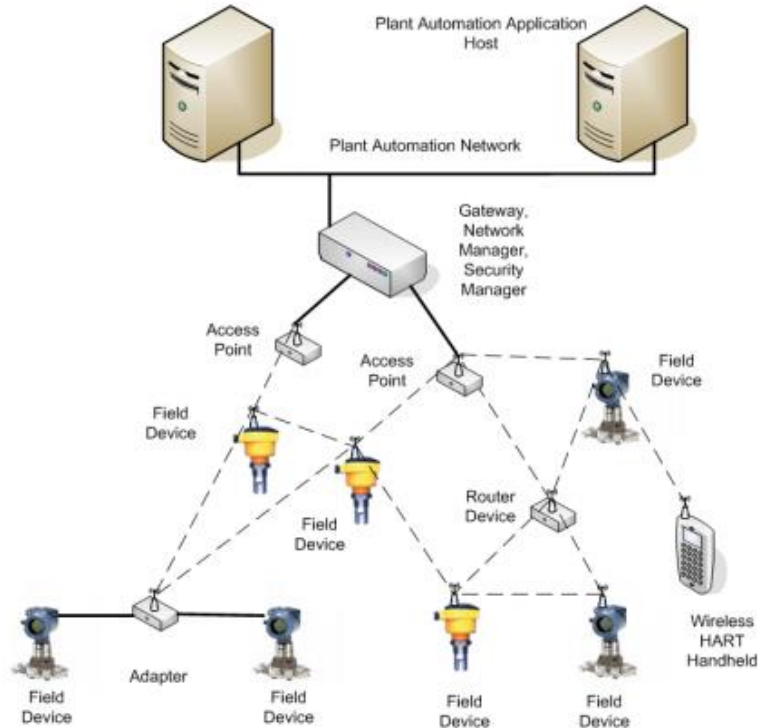


Factory network functions

Network function	Sensor connectivity	Roles
“Proces control” Alarm & Control Critical Normal	Fixed network only Fixed with wireless backup	Operations
Monitoring	Wireless and/or Fixed	Maintenance
Safety	Fixed network only	Operations / HSE

- “We cannot rely our safety on batteries or wireless availability”
- Wireless sensors could be used as a backup for fixed networks

Factory network topology: mesh



Global standards:

- WirelessHeart
- ISA.100

The Connected Worker

Avoid **walking back** to the office

Take **picture**
Avoid confusion

Avoid **paperwork**
Everything digital

Work **done**
Administration **done**

Early detection
of anomalies



Online documents
at your fingertips



Online supervisor
Accelerate learning

Access to SOP
improved safety

Historic data overview
better decision making



Standard tasks creating
process discipline

Where does 5G fit in the plant landscape?

	Current standard	Mobile Standard	Future standard	Possible alternative
Stock management	Barcode	RFID / NFC		5G?
Long range tracking		3G/4G	5G	
Sensors	Fixed network	WirelessHart / ISA.100		5G?
Connected worker	Work offline / Wifi	4G	5G	

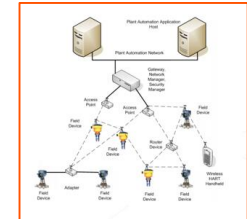
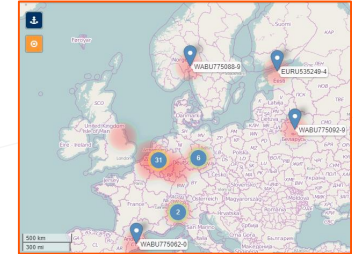
Conclusion

- Chemical industry characteristics
 - Security
 - Physical, wellbeing of our staff
 - Cyber awareness
 - Continuity / reliability
 - Upstream issues have large impact on downstream production

- Logistical tracking
 - Already using 3G, evolve to 4G etc

- Mobile worker
 - Still using paper, moving to digital solutions
 - 4G sufficient for now

- Factory area
 - Fixed networks due to safety standards
 - Following industry standards provided by major vendors



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