

Grain transshipment optimal control

SENUMAC

Introduction



Engineering



Software
development



Production



Consulting



EPC-contractor



Commissioning



Outsourcing



Servicing



Assembling

About the company

SENUMAC



● License holder SIEMENS AG

● SIEMENS SOLUTION PARTNER
Status of International Partner

● SENUMAC
Patented Technology

● 600+ projects since 2007

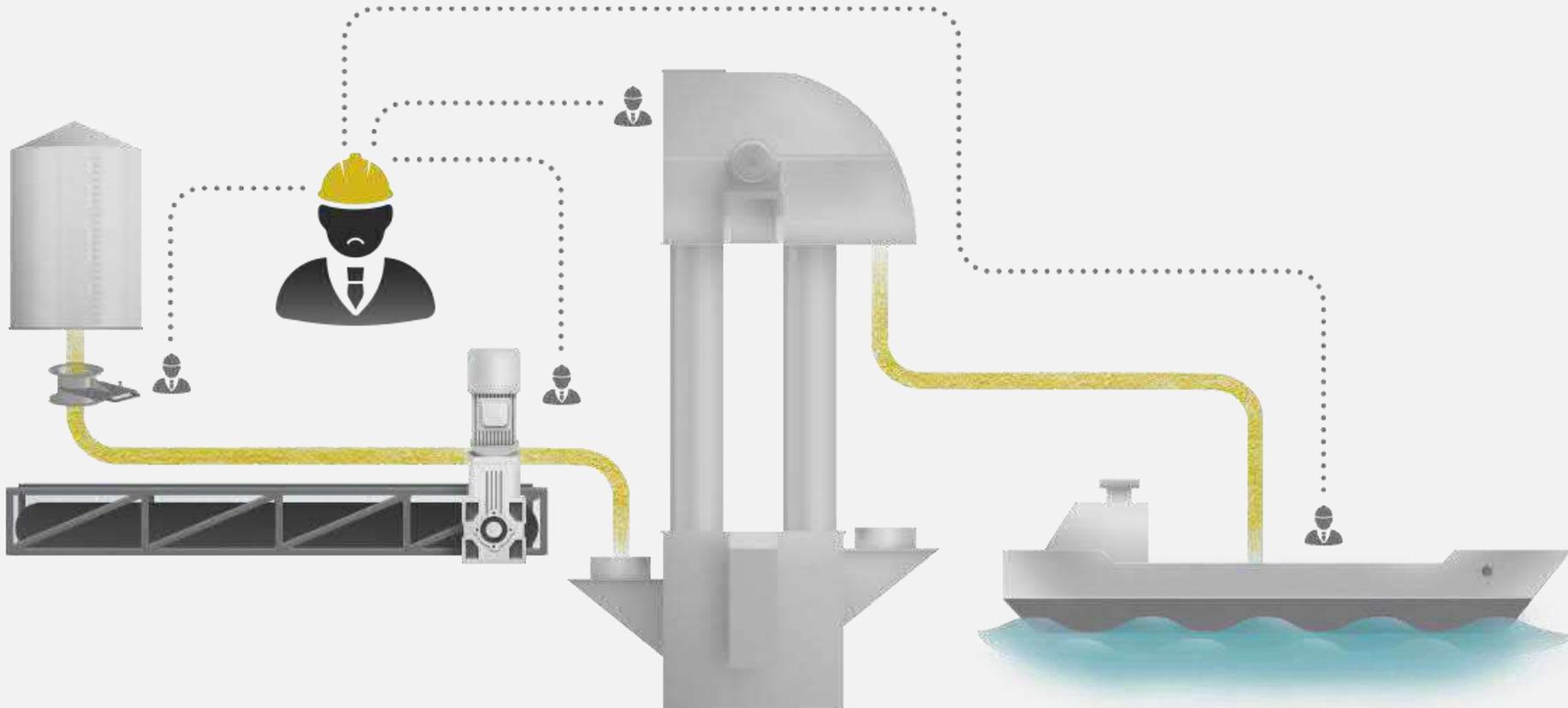
● Company staff 210+ employees
Includes 145+ engineers

● OHSAS 18001:2007
Occupational Health and Safety Management System

● ISO 14001:2015, ISO 50001:2011
Environment Management System, Energy Management System

● ISO 9001:2015
Quality Management System

Problems



-  Medium efficiency
-  High electric power consumption
-  Dependence on operator's experience
-  Emergency shutdowns
-  Manual mixing of grain classes

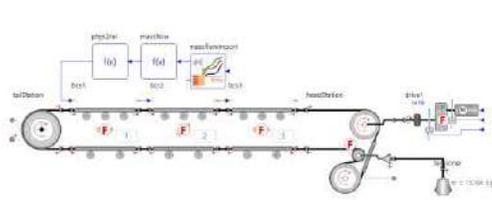
What's SENUMAC?

SENUMAC

SENUMAC composed from:

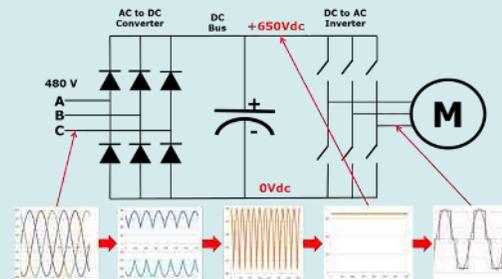
Digital Twin of

- Elevators
- Conveyers
- Gates, Valves
- Siloes



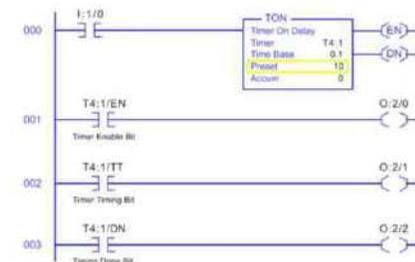
Hardware

- VFD's
- PLC
- Position sensors



Guaranteed and Optimal Control Algorithms

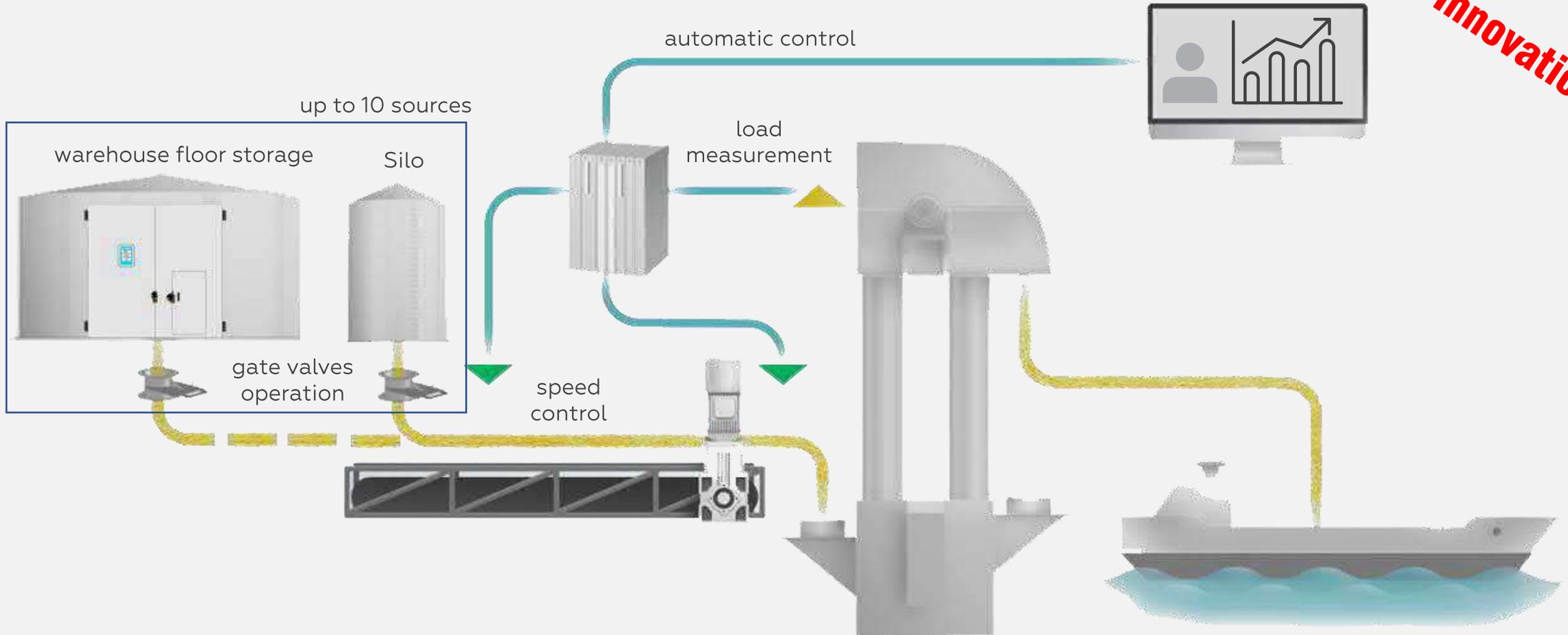
- Software for PLC
- Software for SCADA



Implementation – Ship loading

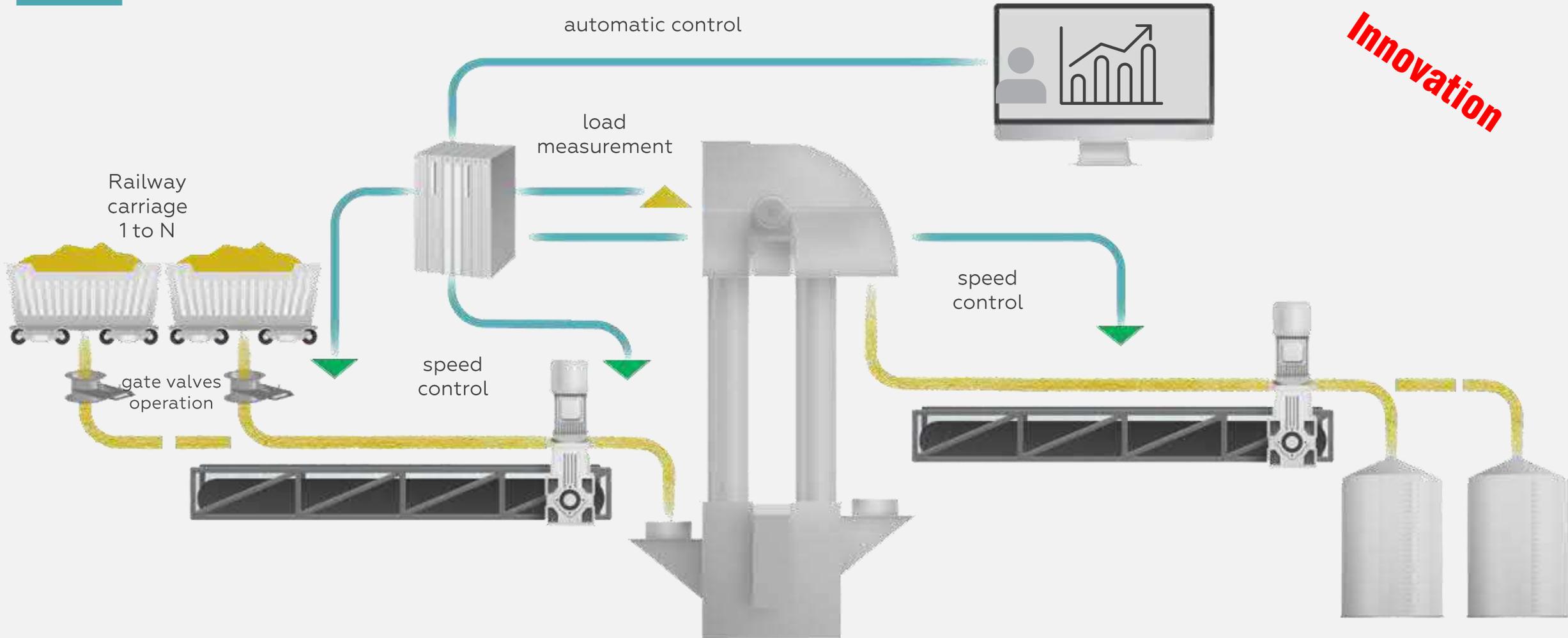
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Innovation



Implementation – Railway transport unloading

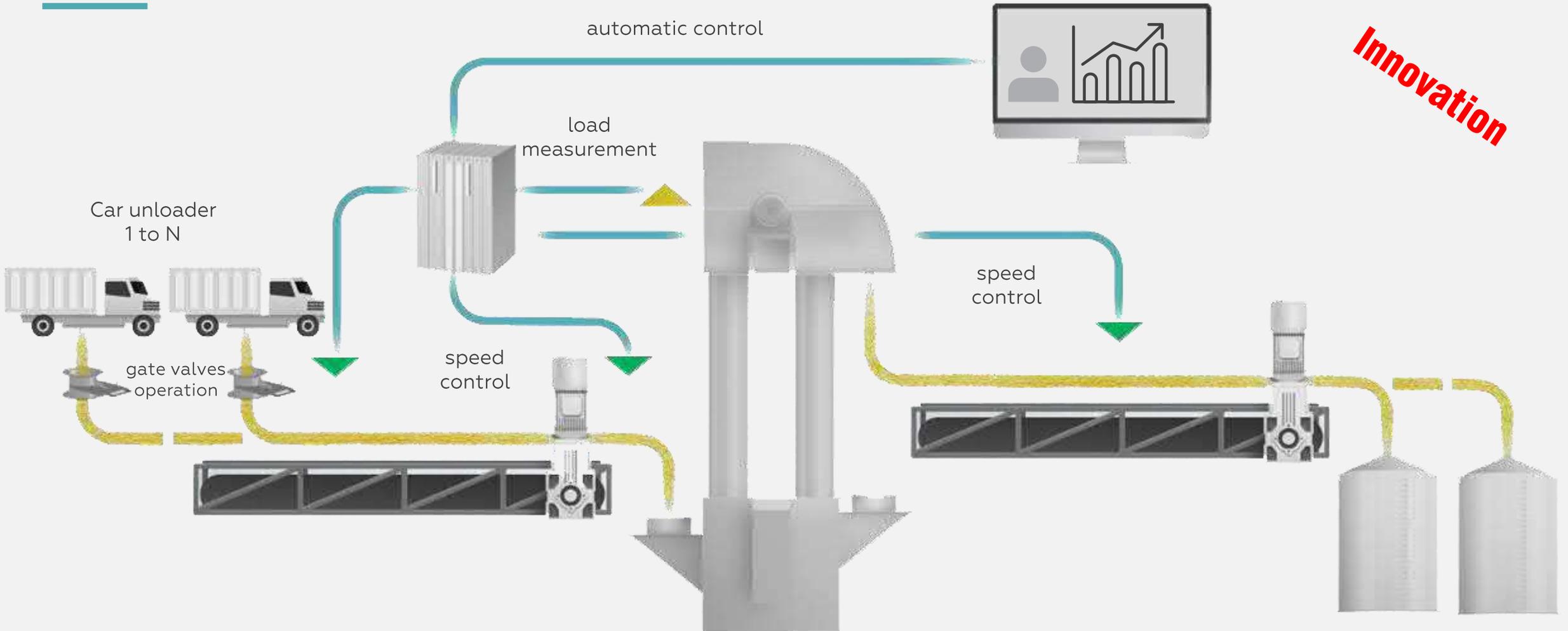
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Implementation – Truck unloading

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Innovation



SENUMAC Technology – Benefits

SENUMAC



To increase productivity up to 20%



To reduce electric power consumption up to 20%



To minimize human factor impact



To automate mixing grain classes

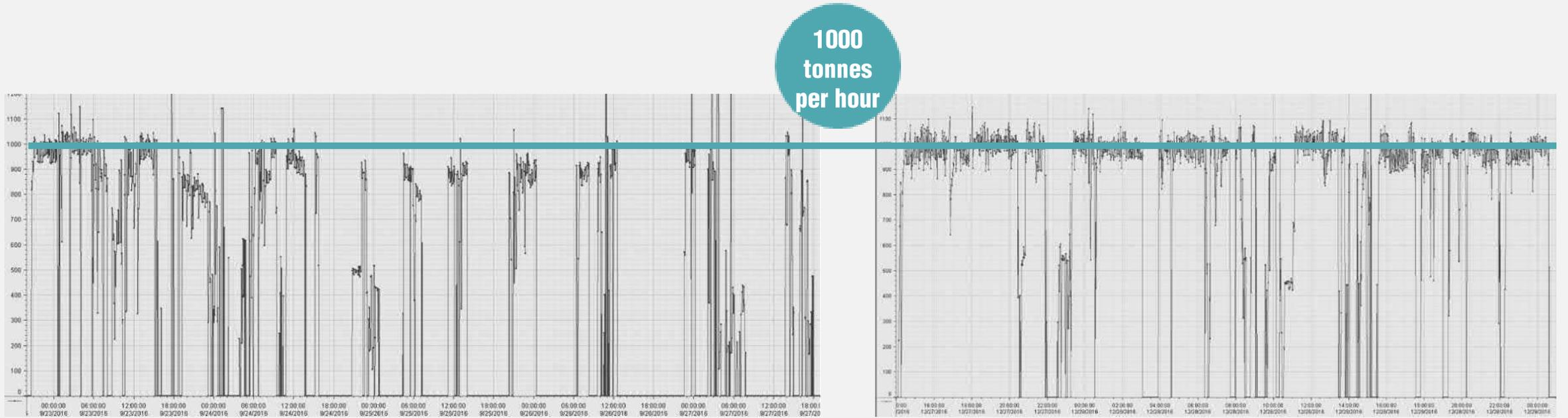


To reduce carbon emission up to 20%



To exclude emergency shutdowns

PANAMAX ship loading performance comparison

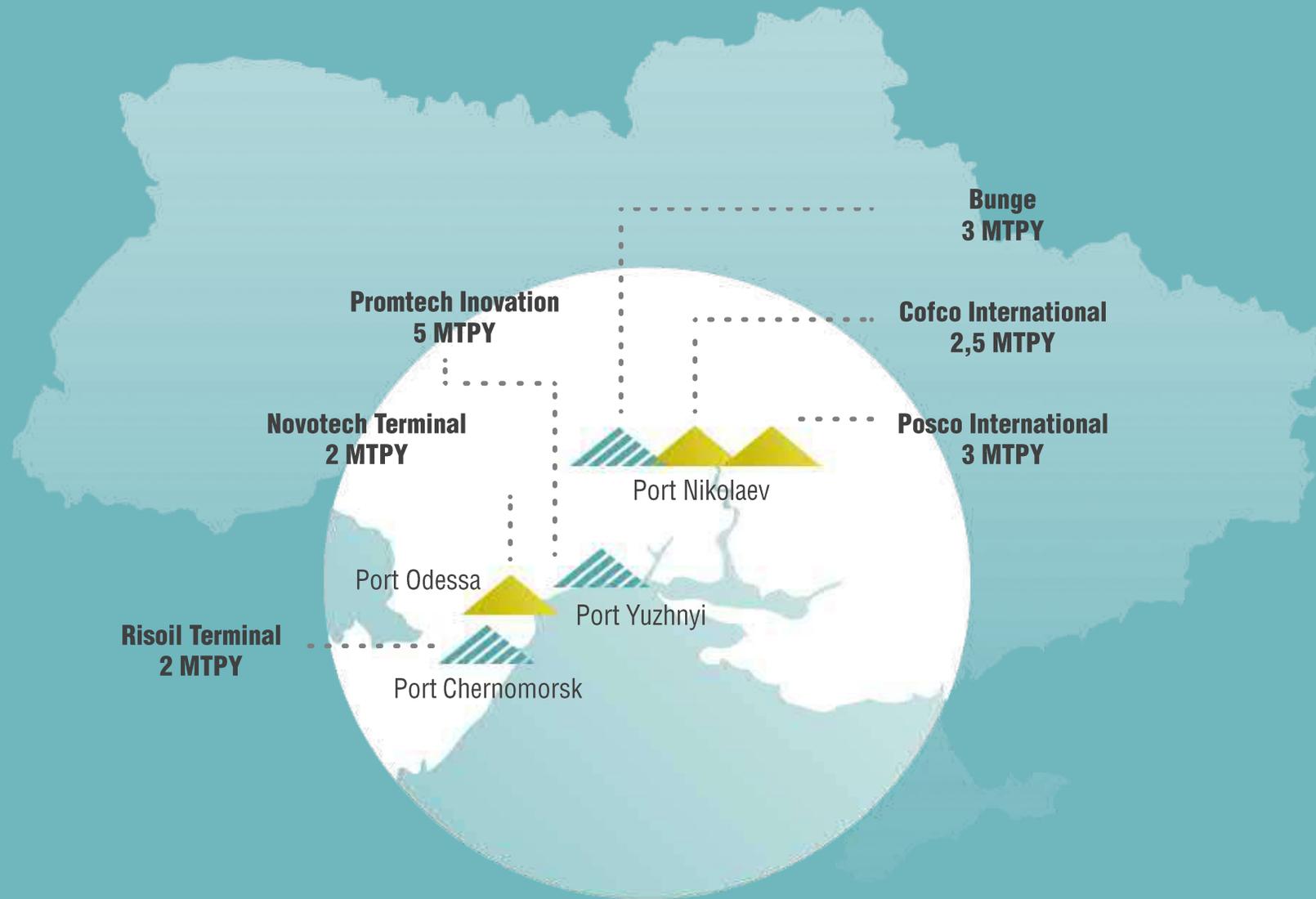


Loading schedule **BEFORE**
SENUMAC implementation

Loading schedule **AFTER**
SENUMAC implementation

Geographic presence

-  Implemented
-  At the stage of implementation
- MTPY** Million tonnes per year



Results of the implementation – New grain terminals **SENUMAC**

COFCO, 2016



- Capacity: 2,5 M.T.
- Electric power cons.: 1,8 kWh per ton
- Reduce carbon emission: 128 ton CO₂ per year
- Increase productivity: +10,2%
- Reduce power cons.: -11%

Energy Saving

490 MWh

NTT, 2018



- Capacity: 3,0 M.T.
- Electric power cons.: 1,3 kWh per ton
- Reduce carbon emission: 147 ton CO₂ per year
- Increase productivity: +13,5%
- Reduce power cons.: -14,5%

Energy Saving

560 MWh

POSCO, 2020



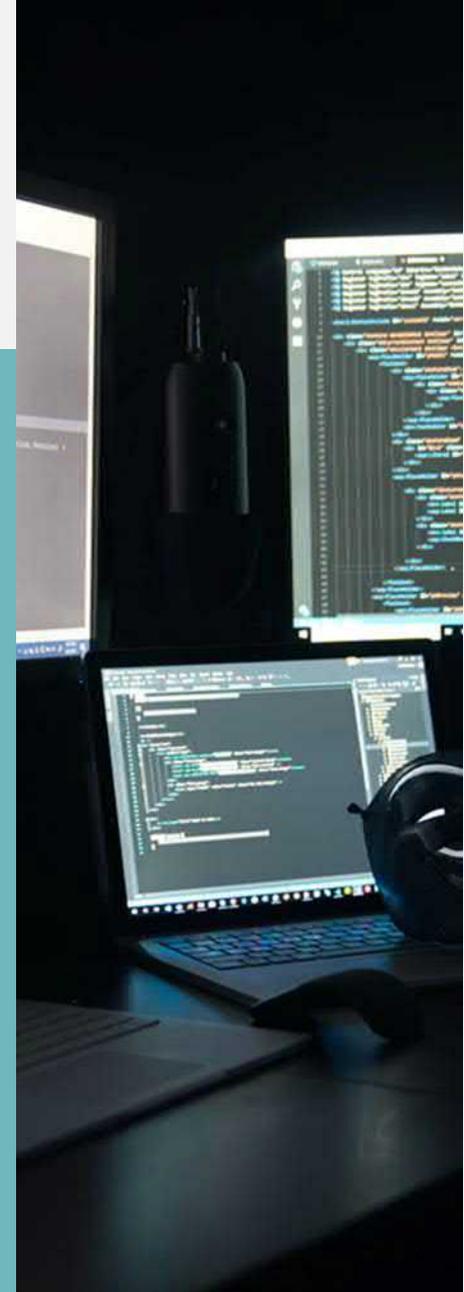
- Capacity: 2,5 M.T.
- Electric power cons: 2,4 kWh per ton
- Reduce carbon emission: 210 ton CO₂ per year
- Increase productivity: +12%
- Reduce power cons: -13,5%

Energy Saving

810 MWh

Implementation, Bunge Nikolayev

SENUMAC



Data BEFORE modernization

Data on Feasibility Study

Data AFTER modernization

Electric power cons.: 1,14 kWh per ton
 Electric power per year: 3 863 MWh
 Average performance: 743 ton/hour

0,97 kWh per ton
 3 298 MWh
 824 ton/hour

0,94 kWh per ton
 3 196 MWh
 865 ton/hour



Energy Saving

560 MWh per year



Energy Saving

660 MWh per year

Reduce carbon emission:

147 ton CO₂ per year

Reduce carbon emission:

173 ton CO₂ per year

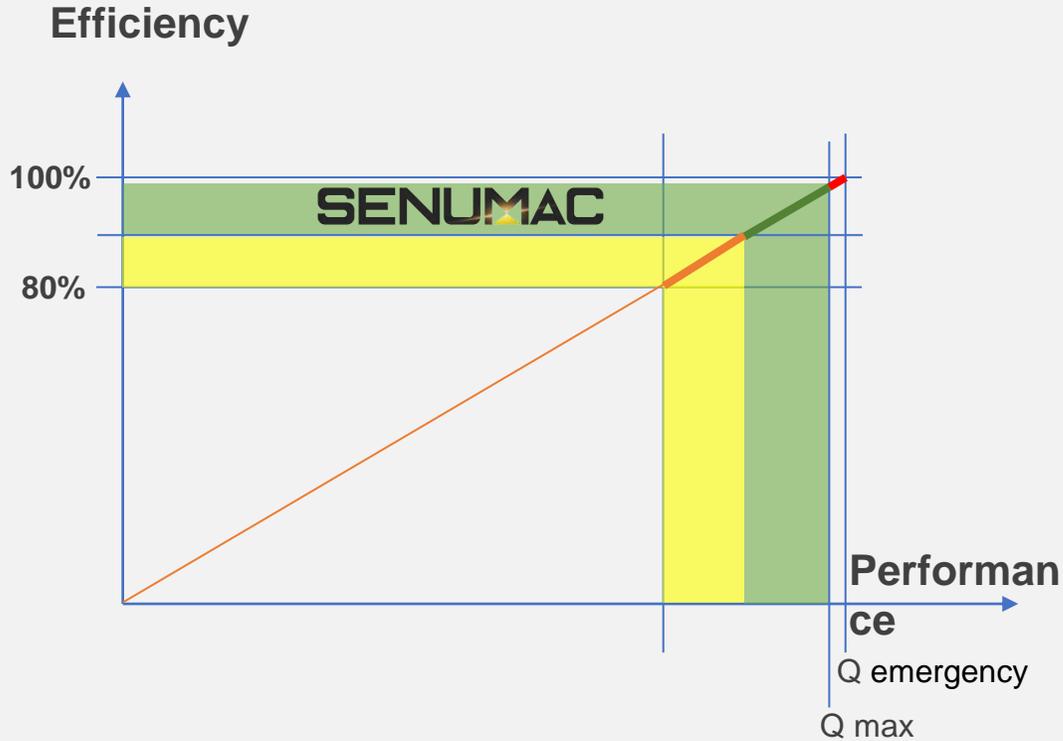
PAYBACK PERIOD

3,5 year

PAYBACK PERIOD

1,8 year

Where does the efficiency come from?



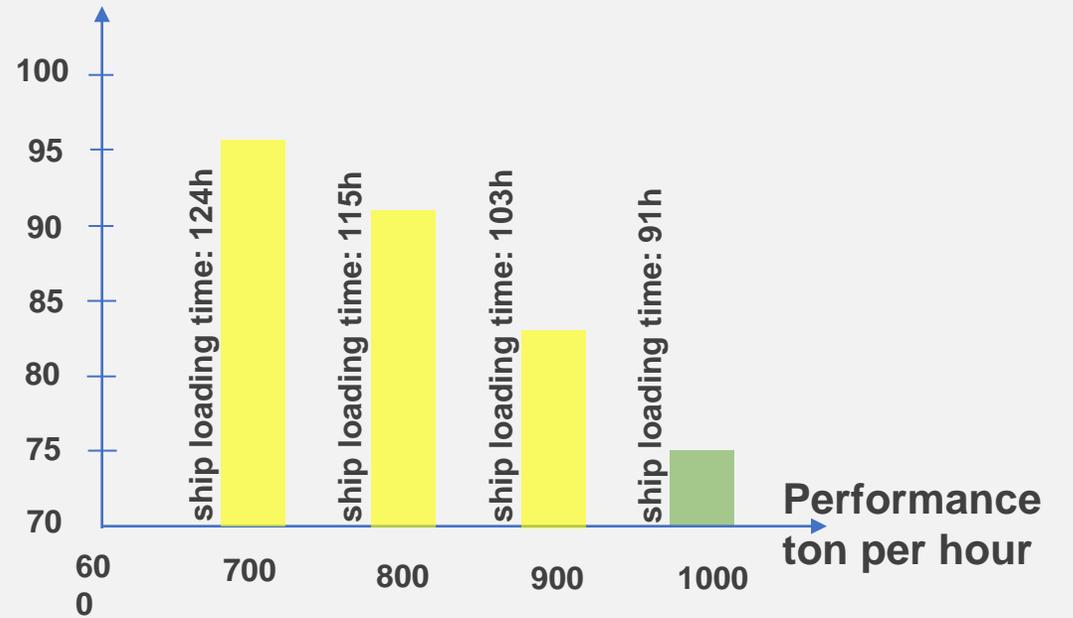
Range with base DCS



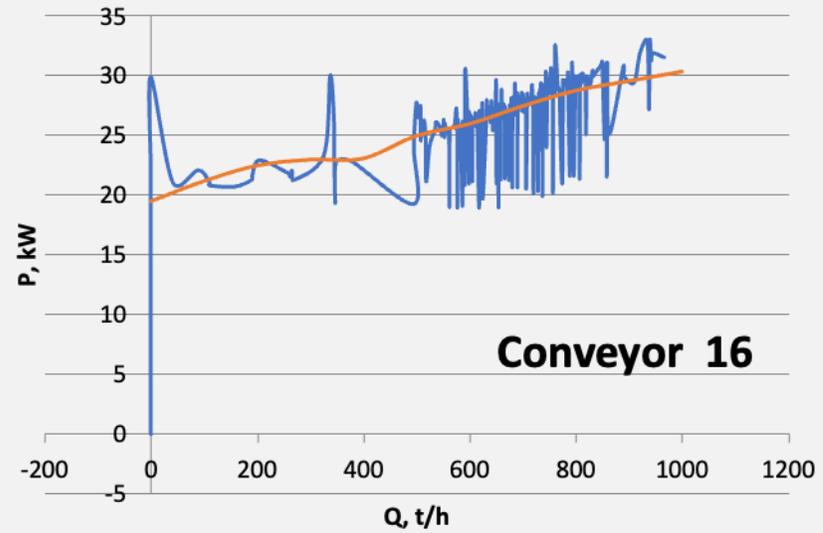
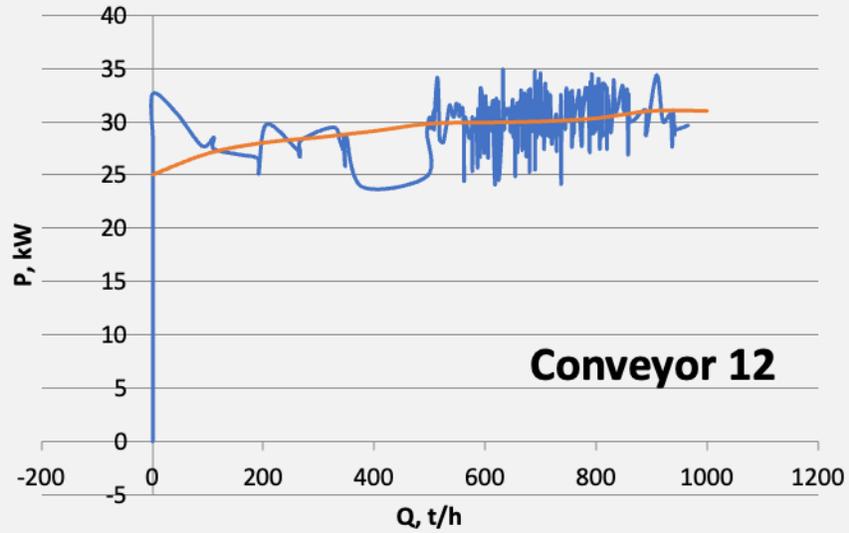
Range with Senumac



Energy, MW per 60 000 DWT



Where does the efficiency come from?



Stages of implementation

1

Commercial offer Feasibility study

- Preliminary analysis
- Commercial offer for a feasibility study
- Determination of the timing of the implementation

**Term: up to 2 weeks
Cost: free**

2

Feasibility study

- Activity on SITE
- Preparing of report
- Simulation of SENUMAC technology
- Commercial offer for modernization
- Payback calculation

**Term: up to 1,5 month
Cost: 20-40 kEUR**

3

Prepare technical documentation for modernization

- Ordering equipment
- Preparing technical documentation
- Preparing plan and schedule of modernization
- Adaptation software

**Term: up to 3 month
Cost: Individual price**

4

Supply and installation of equipment

- Delivery equipment on SITE
- Installation equipment on SITE

**Term: up to 3-9 months
Cost: Individual price**

5

Work execution

- Prepare AS-Build documentation
- Testing
- Start-up and Commissioning
- Report Feasibility study

**Term: up to 1,5 month
Cost: Individual price**

Relevance

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Calculate for grain port terminal 3 million ton per year:



Energy Saving **580 MWh per year**

70 kEUR (for Ukraine)



Additional Energy Saving **170 MWh per year**
(aspiration, lighting, etc.)

20 kEUR (for Ukraine)



Saving ship loading time:

Reduce by 13% or addition 390 000 ton



Reduce carbon emission:

145 ton CO₂ per year



DISCOVER THE LIMITS
SENUMAC

