Federal Ministry
for Economic Affairs
and Energy

MITTELSTAND
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More Energy Efficiency Through Process Automation

Companies save – the Environment benefits

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ZVEI – German Electrical and Electronic Manufacturers` Association

Auckland, New Zealand, October 15th, 2018

Agenda

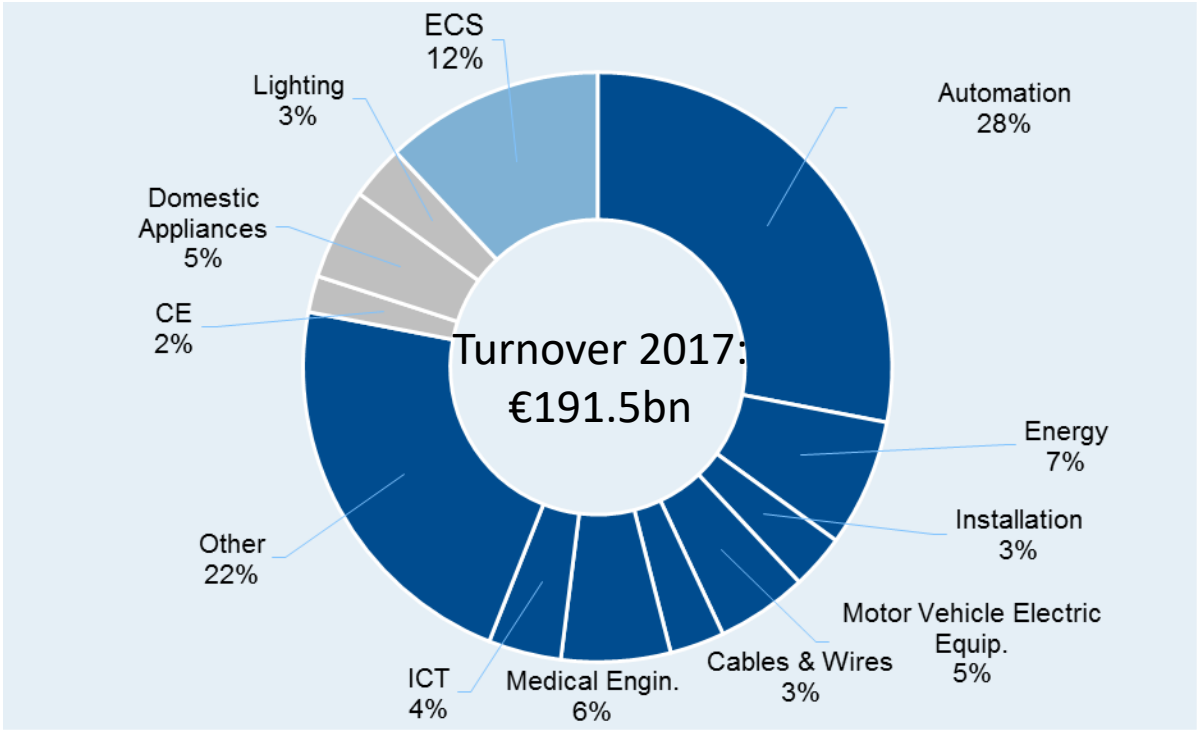
1. **General Information**
2. What is Process Automation about?
3. Energy Efficiency and Lifecycle Costs
4. Application in Different Subsectors
5. Industrie 4.0 drives Energy Efficiency

ZVEI – German Electrical and Electronic Manufacturers`Association

One of the world's largest electrical and electronics industry associations:

- 1,600 member companies
- Member companies representing more than 80 % of the German electrical and electronic industry
- Expertise provided by 150 employees
- A network of competence comprising over 5,000 experts
- Headquarter in Frankfurt, offices in Berlin, Brussels and Beijing (in cooperation with Orgalime)

German Electrical and Electronic Industry



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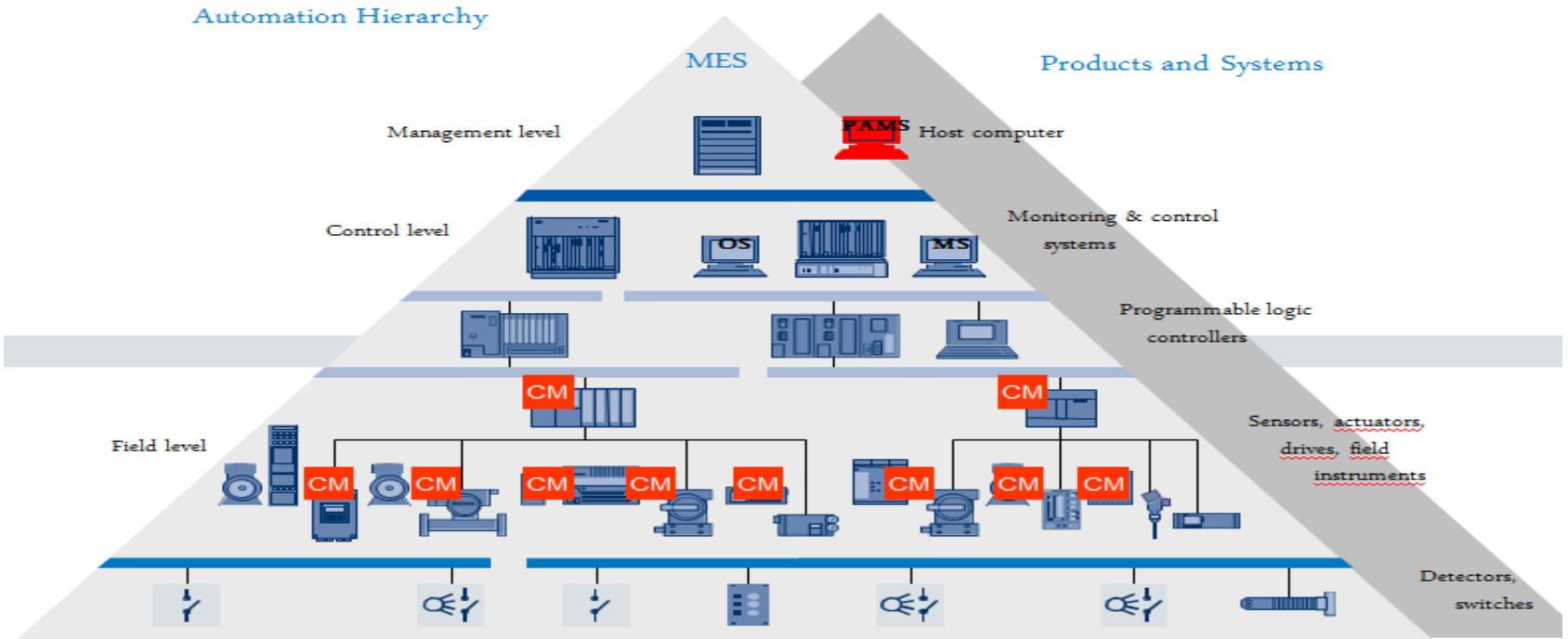
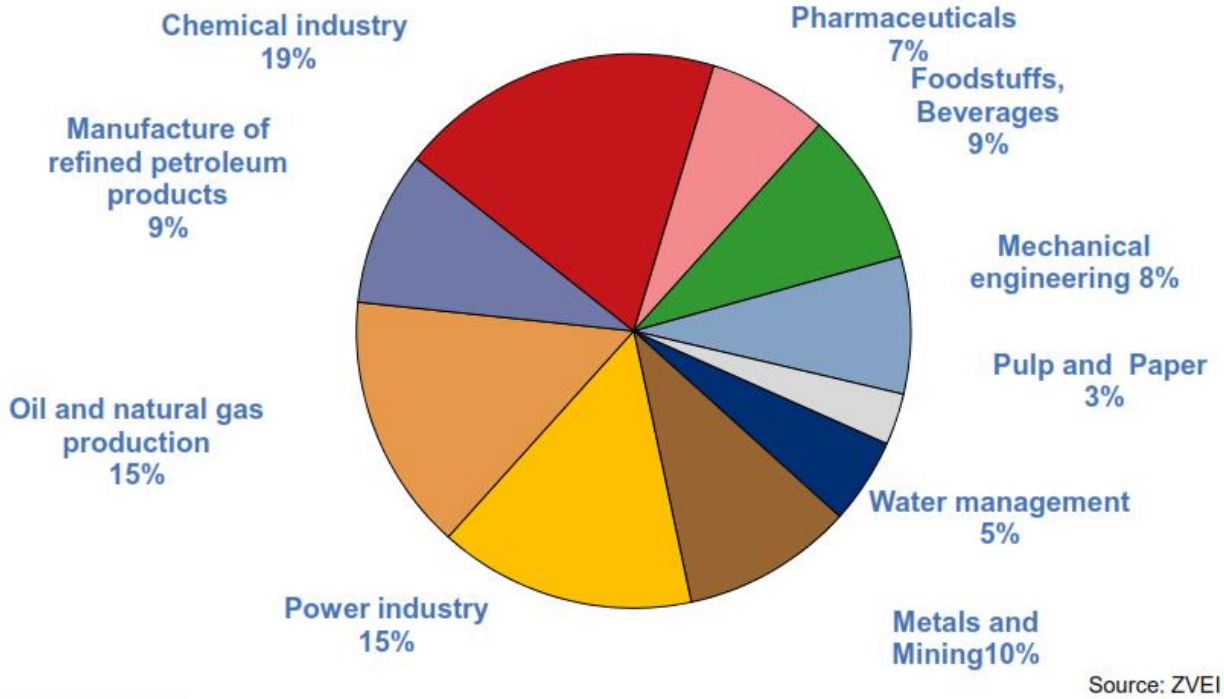
What is Process Automation ?



Source: Siemens

End-user sectors for Process Automation in 2015 (in % of worldwide turnover)



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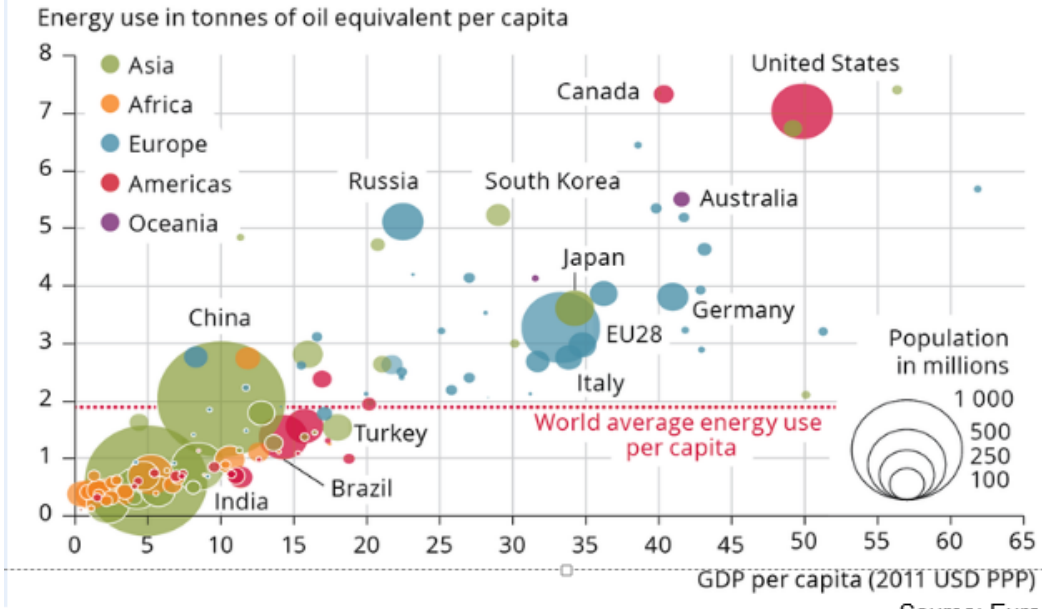
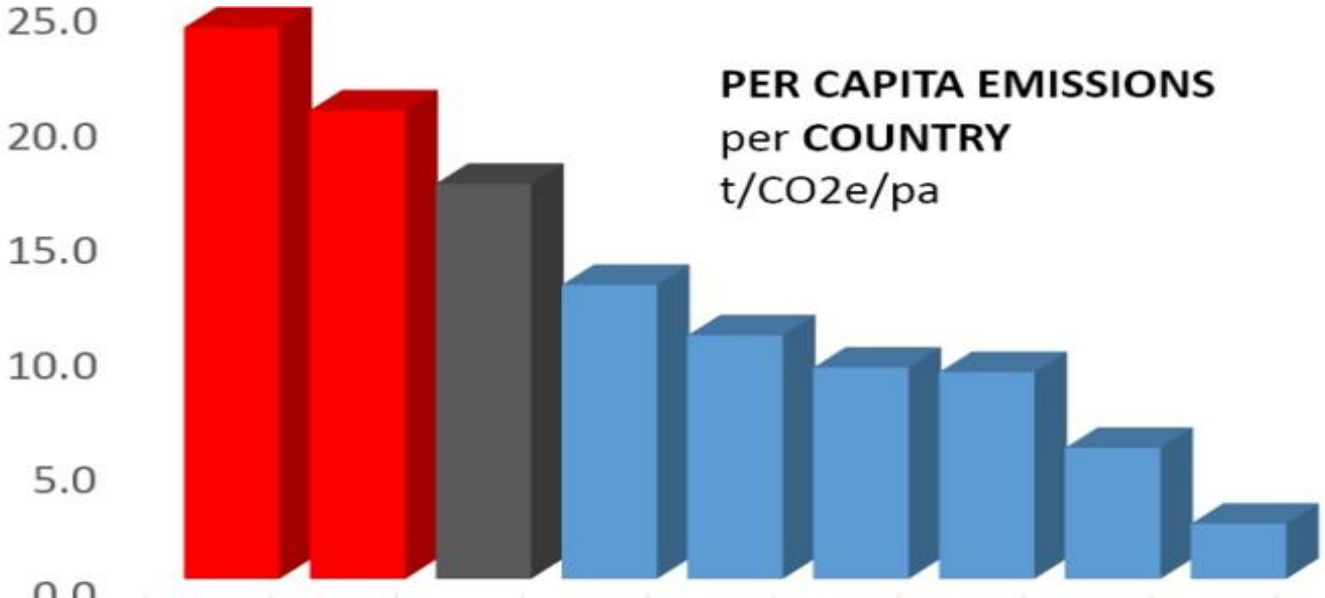
Correlation of energy consumption and GDP per person

The graph shows per capita energy consumption (kg oil equivalent) vs. per capita GDP, PPP (current international $). The size of the bubbles denotes total poulation per country. All values refer to the year 2011.



Source: European Environment Agency

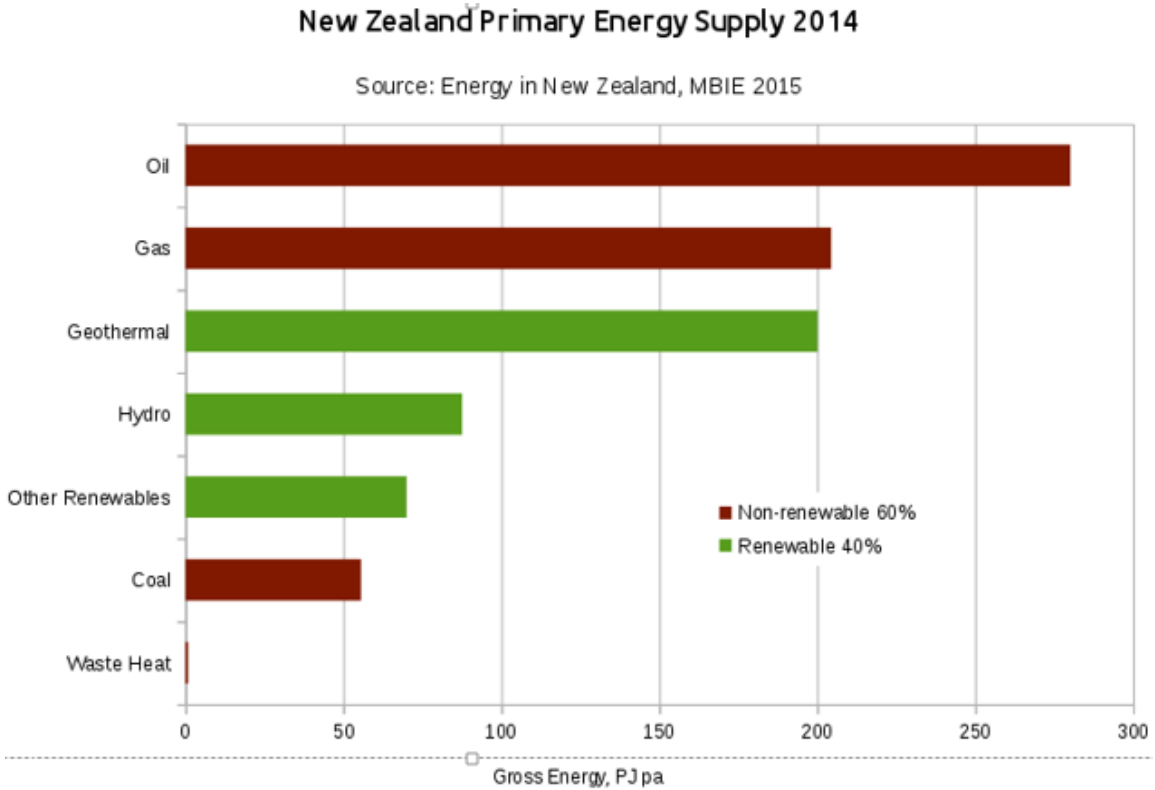
Per Capita Emissions per Country



	Aus	US	NZ	Ire	Nor	UK	China	Brazil	India
2012	24.0	20.4	17.2	12.8	10.6	9.2	9.0	5.7	2.4

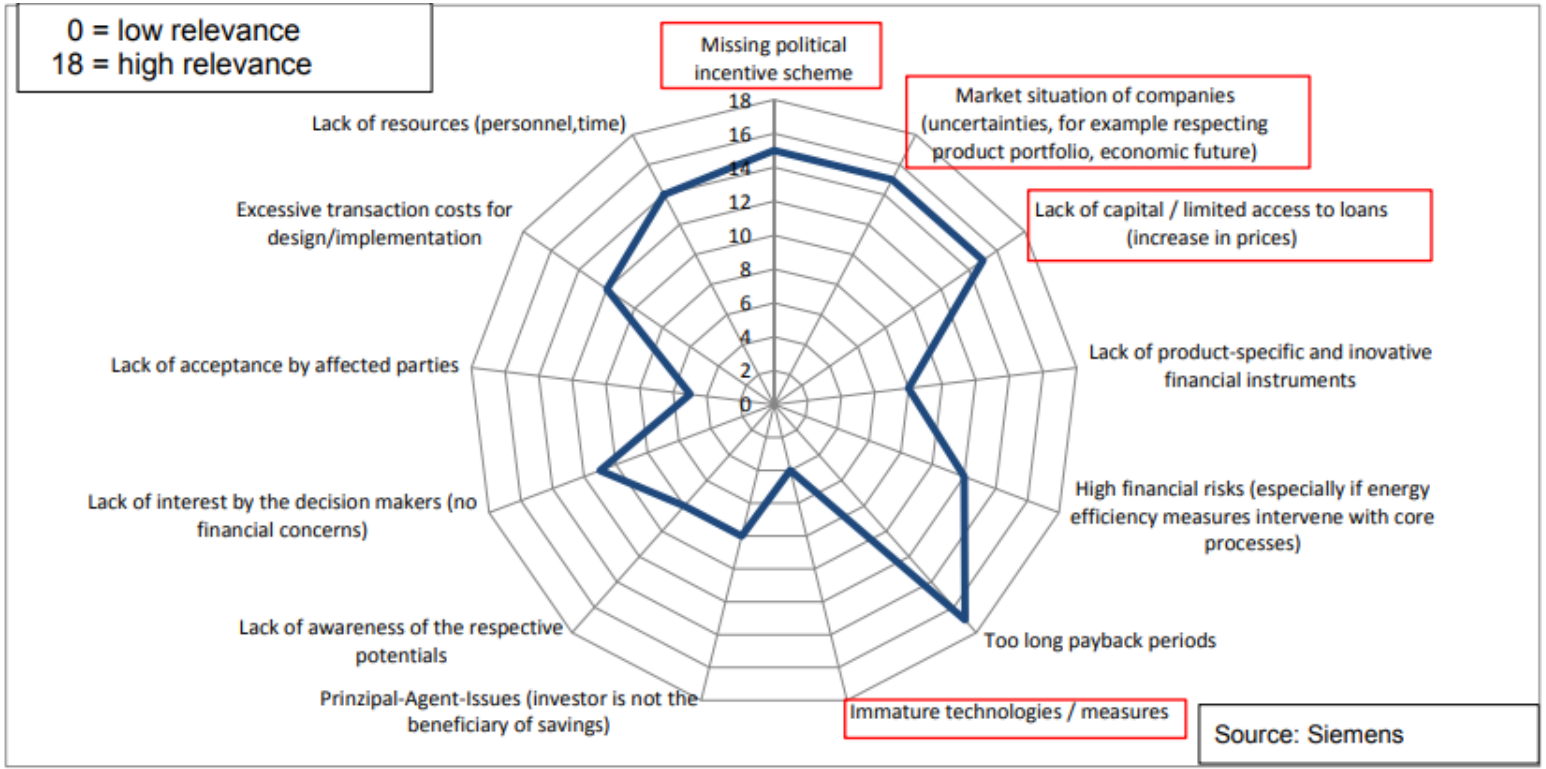
SOURCE: Ministry for the Environment
https://www.climatechange.govt.nz/reducing-our-emissions/our-responsibility.html

New Zealand`s Energy Mix



Energy Efficiency Potential is not being harnessed to the full

Obstacles for more Energy Efficiency



Companies benefit from considering the Lifecycle Costs

- Approx. one third of the energy efficiency potential is not being realized because of asking for too short pay-off time for the project (less than 3 years). But this is too short-sighted, because energy efficiency pays off over the lifecycle of an investment.

- To strengthen consideration of lifecycle costs in the public and private sectors, ZVEI and Deloitte have developed a practical tool for various user groups. This presents investment alternatives in a transparent manner and makes it possible to compare them in terms of energy efficiency and their economic effects.

Lifecycle Cost Evaluation; Example of a wastewater treatment plant

- Waste water treatment plants in Germany account for:
  - 20% of the consumption of electrical energy of the municipalities
  - 3 million tons of CO2-equivalents

Source.
Endress+Hauser

Wastewater treatment plant – Comparison between standard and optimization

Example: Wastewater treatment plant at Bachwis, Fällanden, Switzerland (comparison between standard and optimization)

	Investment Project I	Investment Project II
Measure	Time-controlled aeration basin (standard modernization)	Aeration basin with oxygen and ISE sensors, i.e. additional ammonium and nitrate measure-ment (optimization)
Investment amount	Initial investment of CHF 90,000, then CHF 2,000 per year	Initial investment of CHF 208,000, then CHF 6,000 per year
Energy costs	CHF 110,000 per year	CHF 63,000 per year
Period under consid.	15 years	15 years

Wastewater treatment plant – Analysis (Standard vs. Optimization)

WWTP analysis (standard vs. optimization)

Energy efficiency	Investment Project I	Investment Project II
Cash equivalent of energy costs for one-off project implementation	1,313.2	752.1
Cash equivalent of energy costs over harmonized project life span	1,313.2	752.1
Nominal energy savings, absolute		561.1
Annual annuity (energy costs)	110.0	63.0
Nominal energy savings (per year)		47.0
Percentage energy savings (cash value observation)		-42.7 %
Economical comparison/study/profitability comparison	**Investment Project I**	**Investment Project II**
Useful life (years)	15	15
Installation phase (years)	0	0
Operating phase (years)	15	15
Deinstallation phase (years)	0	0
Useful life with harmonized project life span (years)	15	15
Discount rate	3.0 %	3.0 %
Cash equivalent of lifecycle costs for one-off project implementation	1,427.0	1,031.7
Cash equivalent of life cycle costs over harmonized project life span	1,427,0	1,031.7
Annual annuity	119.5	86.4
Percentage savings (cash value observation)		-27.7 %
Select →	**Investment Project II**	

Source: ZVEI, Endress+Hauser

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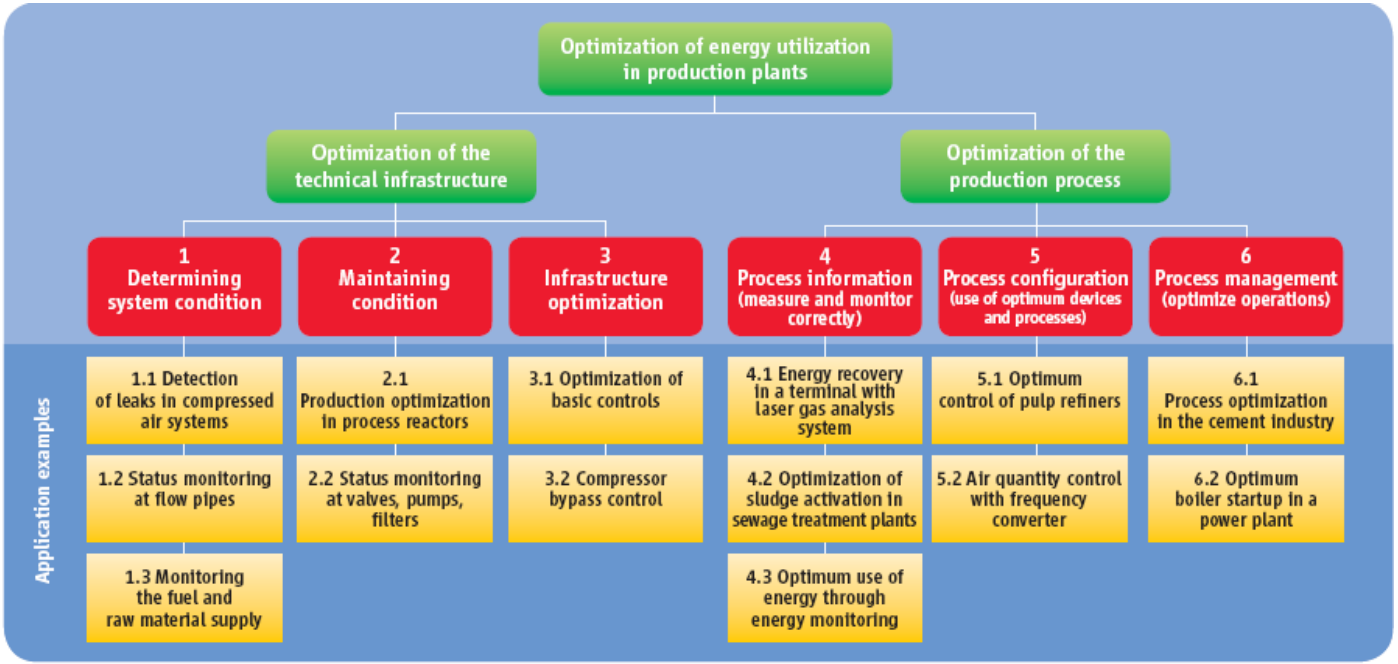
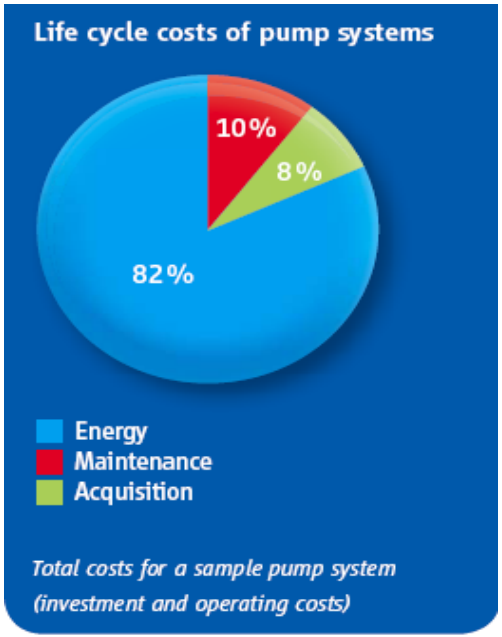
Versatile contribution of process automation to improving energy efficiency



Source: ZVEI, Measurement and Process Automation Section, 2009

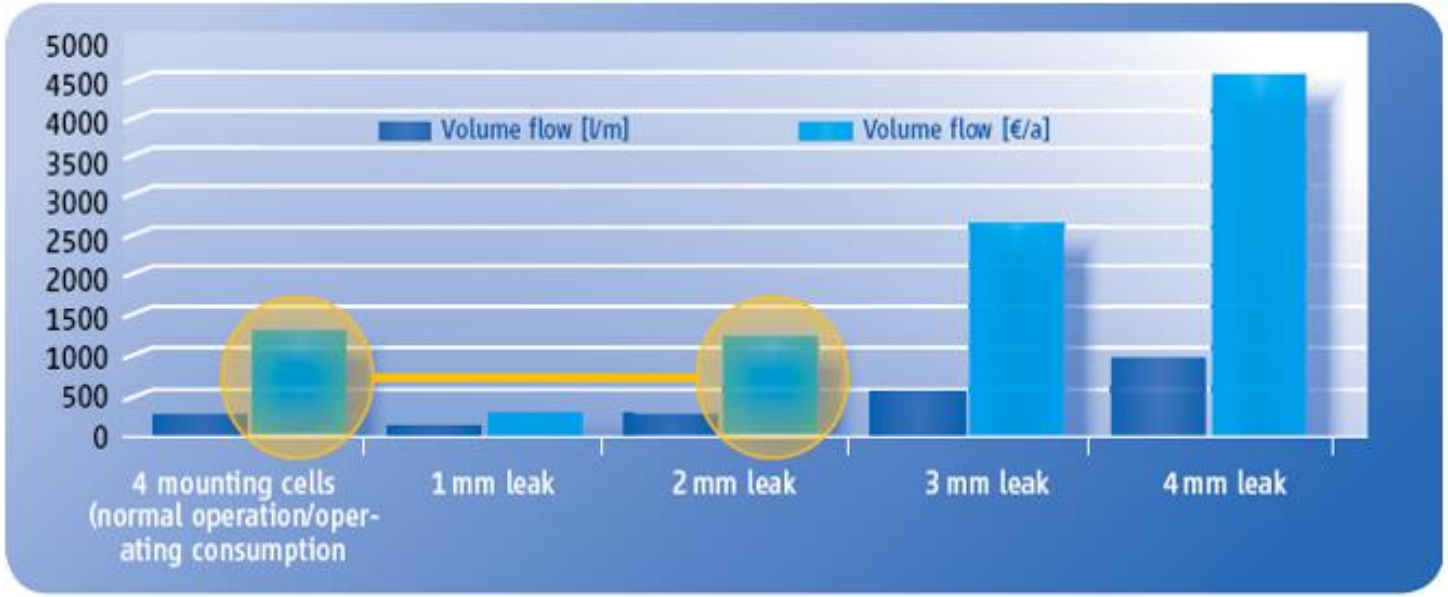
1. Energy savings in hydraulic systems (pumps)



Source: Bavarian State Office for the Environment, Guidelines for the Efficient Use of Energy in Commerce and Industry, 2009, P. 12

Businesses frequently tend to ignore the fact that the acquisition costs of a system often only account for a fraction of the overall cost of ownership. In a pump system, 82 % of costs can be attributed to energy consumption. Therefore when planning a system the focus should not only be on the acquisition costs. The various costs that are incurred over the entire life cycle of a system must be taken into consideration.

2. Detection of leaks in compressed air systems



A leak with a diameter of 2 mm causes compressed air loss equivalent to the volume of compressed air consumed by the production plant.

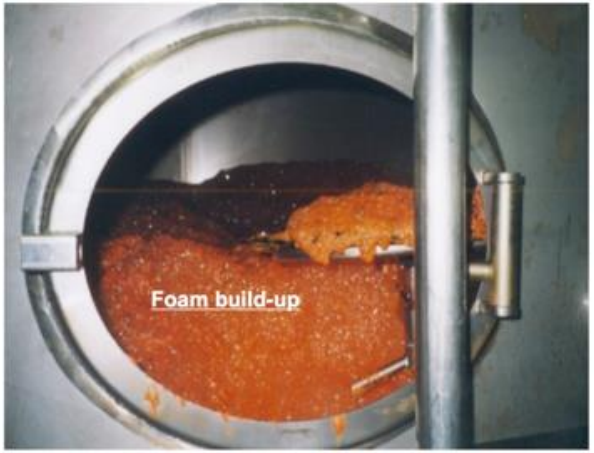
Source: Festo

Source: ABB

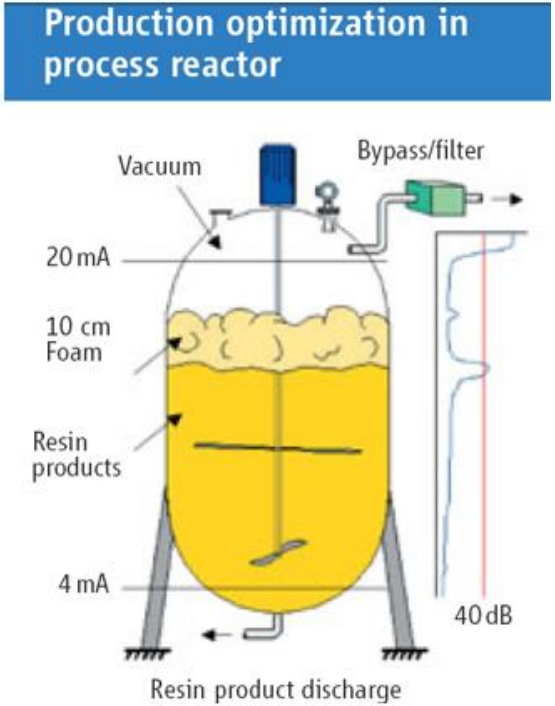
3. Status monitoring at flow pipes

Source: Siemens

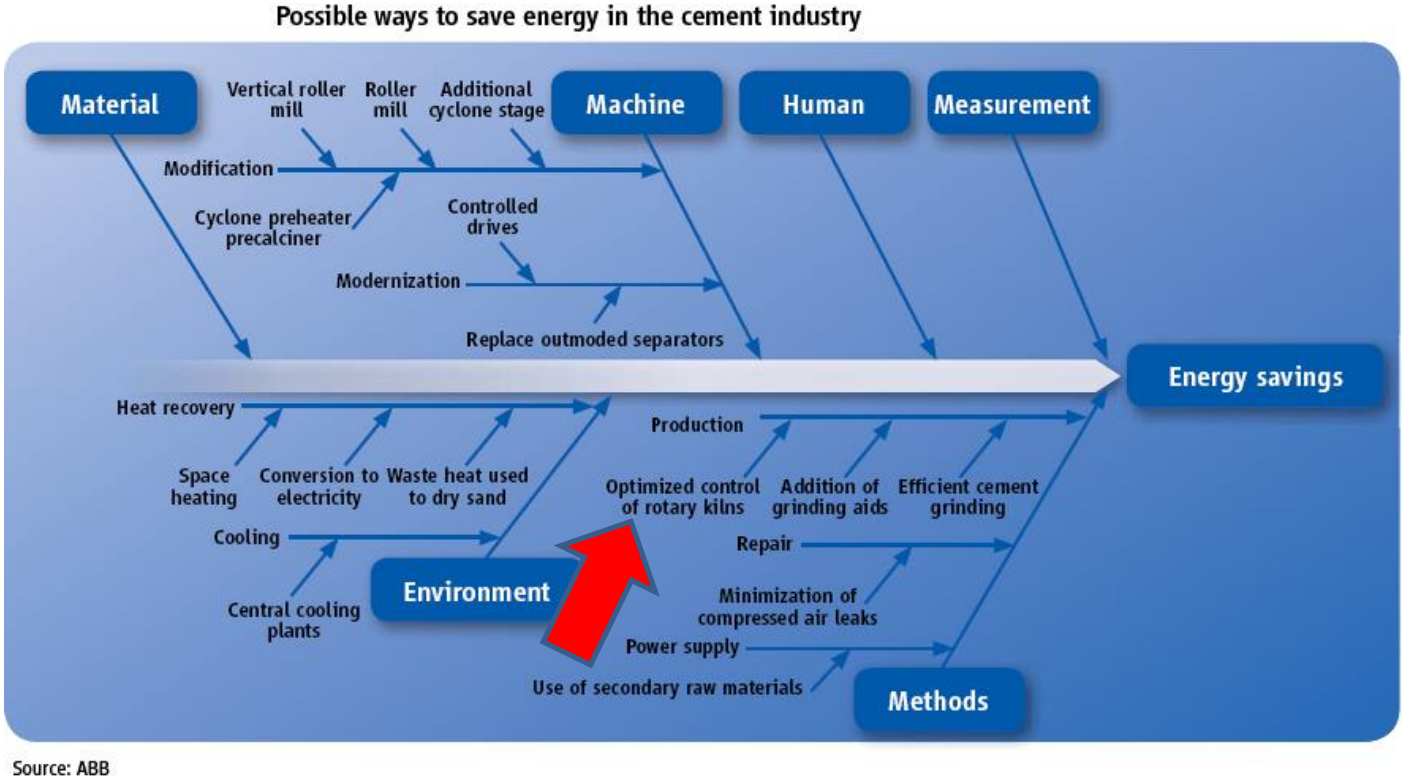
4. Production optimization in process reactors (Chemical industry)



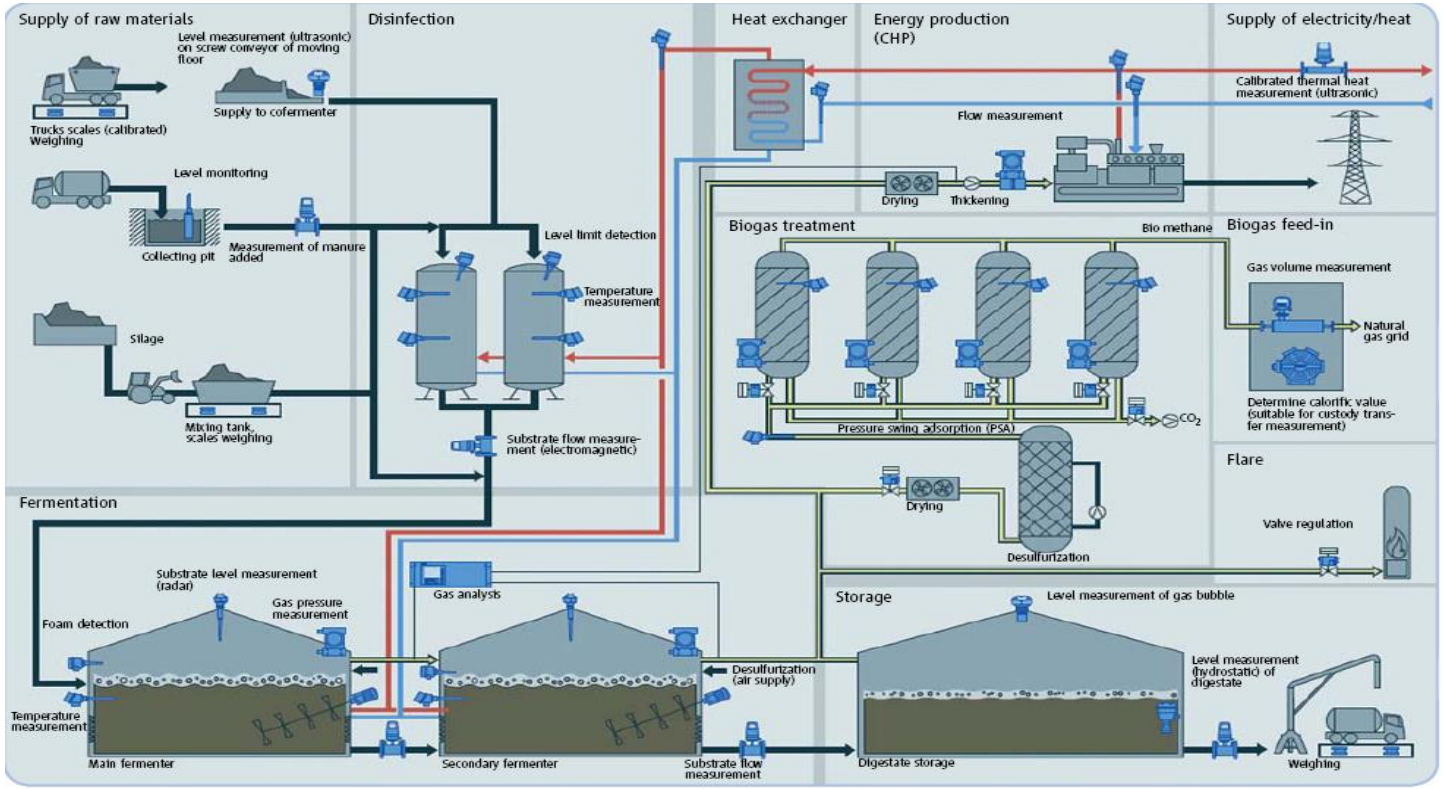
Source. Siemens



5. Energy efficiency in cement manufacturing



6. Energy production (biogas plants)



Overall process of a biogas plant
Source: Siemens

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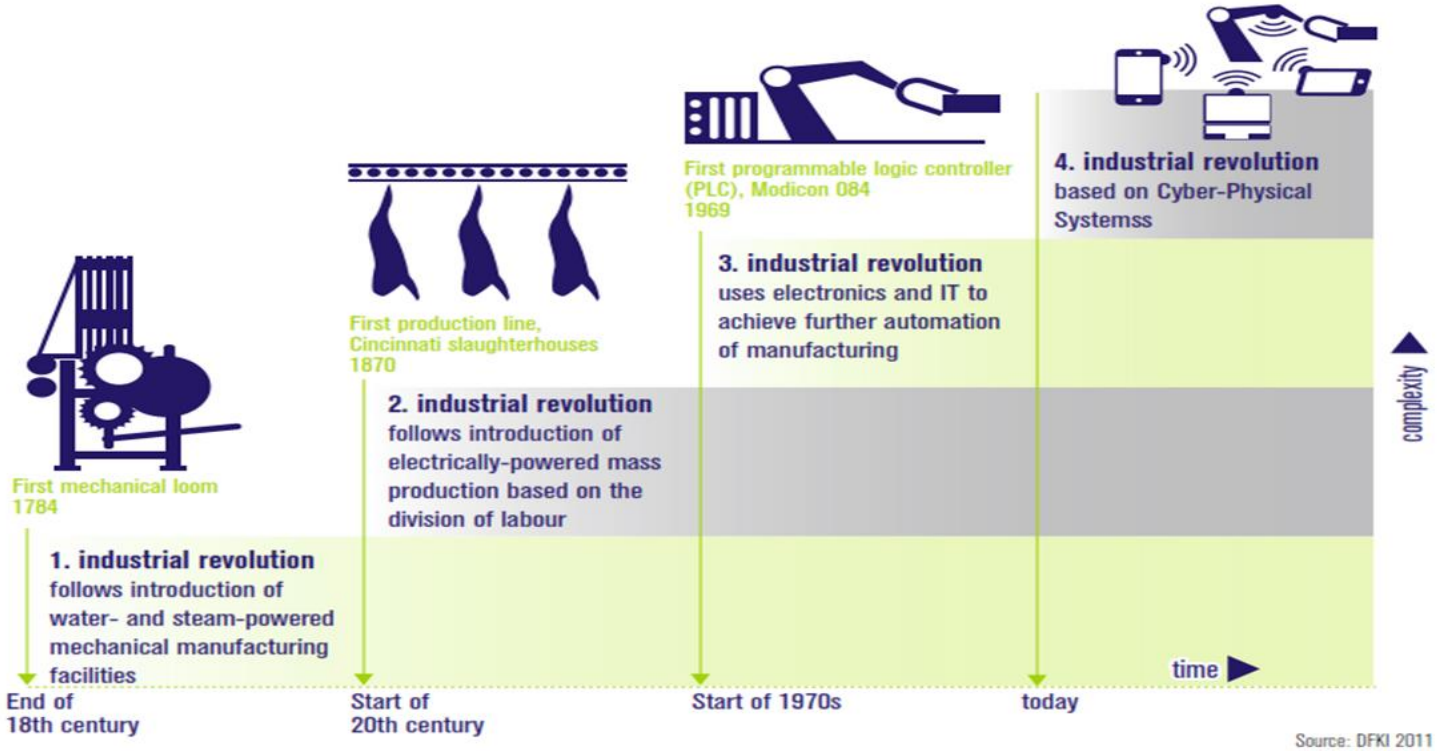
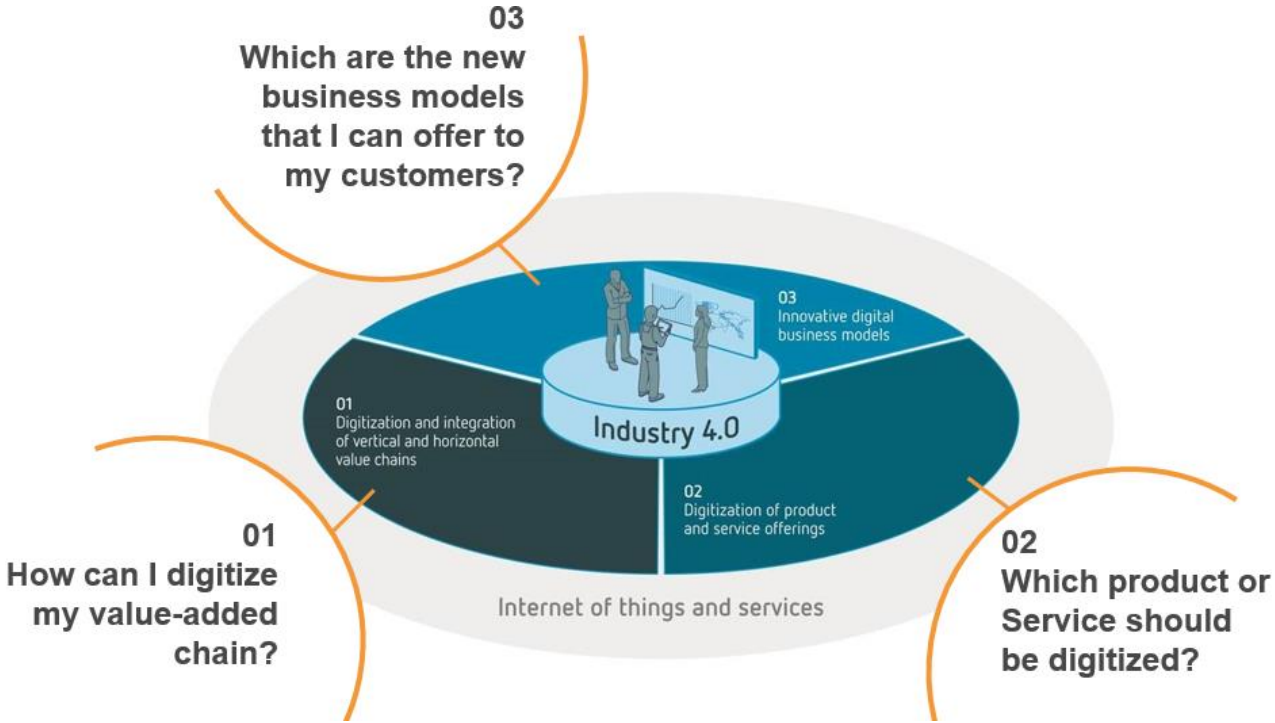
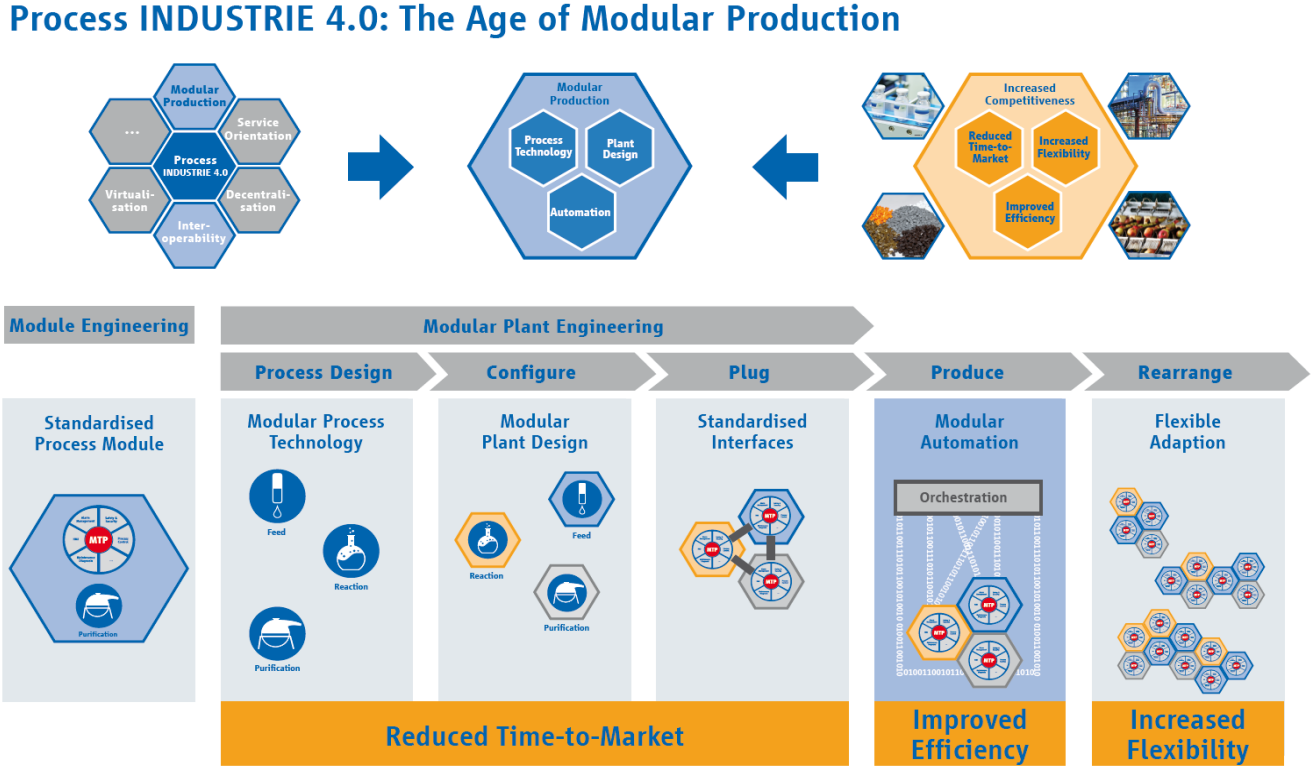
Industrie 4.0 – The 4th industrial revolution



Industrie 4.0 affects the entire economy: 3 questions every company has to ask themselves



Process INDUSTRIE 4.0: The Age of Modular Production



Examples for Modular Production in Process Industries

… first industrial applications are realized in chemical und pharmaceutical industries

Polymers, multi-product

BASF We create chemistry

ARKEMA

Polymers, multi-product **Intermediate, dedicated**

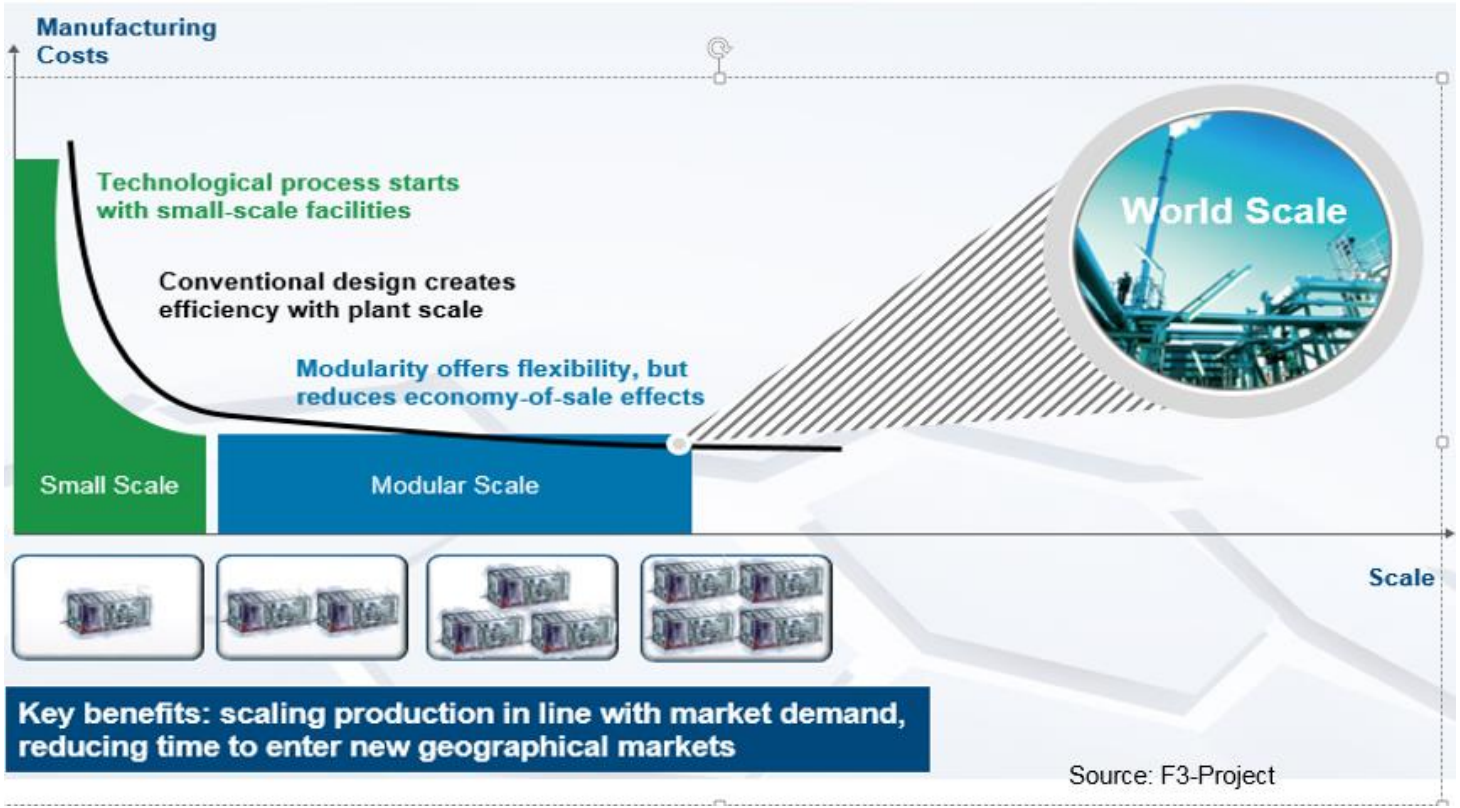
BAYER

SOLVAY

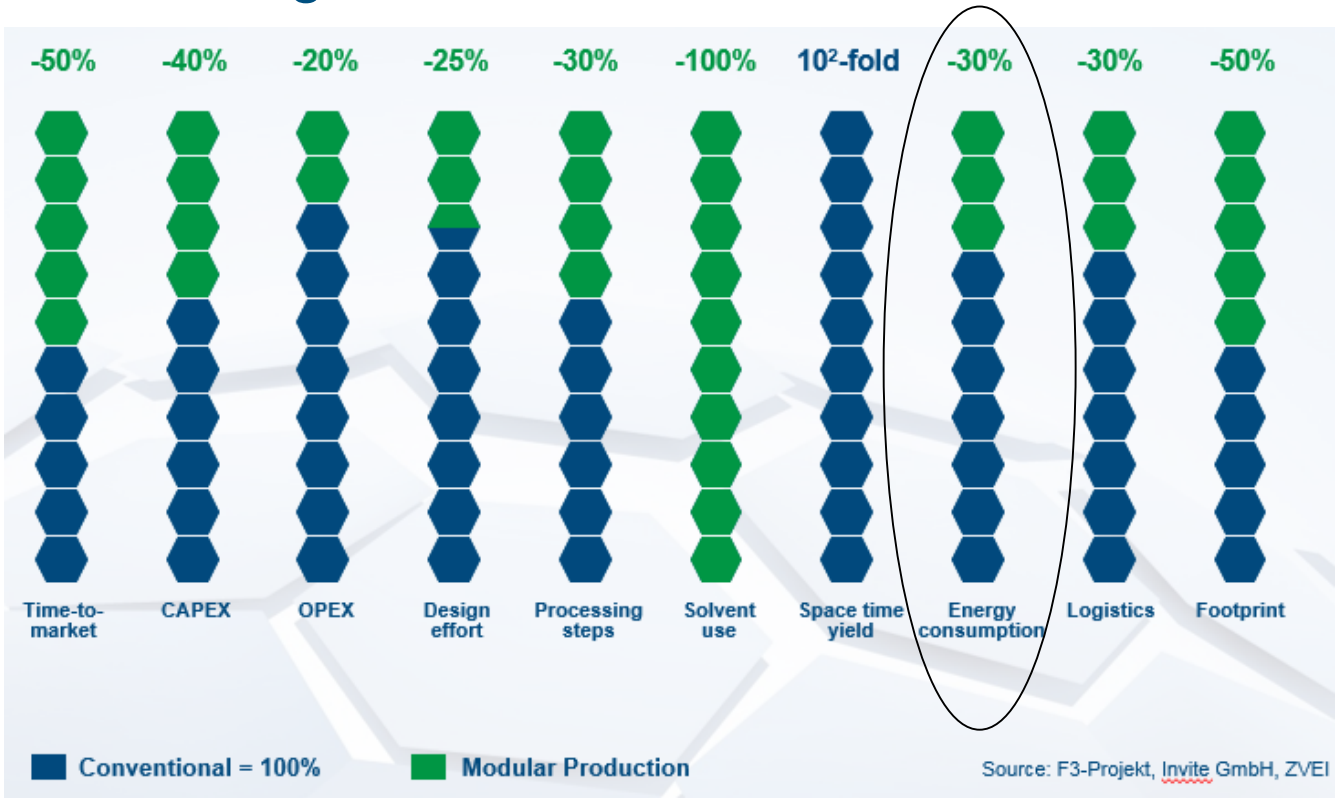
Alkene, dedicated

EVONIK INDUSTRIES

Modular approach: Numbering-up instead of scaling-up



Potential savings with Modular Production



Download our energy efficiency brochure for free
www.zvei.org

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Thank you for your attention!

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