



BEST-IN-CLASS CAPEX OPTIMIZATION

Service offerings – invest cost & CapEx-associated CO₂e reduction

EFESO
MANAGEMENT CONSULTANTS

COST & VALUE ENGINEERING
INSIGHT

How to maximize investment value by stepping-up to best-in-class CapEx optimization

Global organizations say cutting costs is a priority... yet they're failing to use the levers right in front of them

Across all industries and globally, hundreds of billions of Euros are spent each year on new production technologies and facilities.

Entering new product segments, meeting net zero carbon footprint requirements and securing supply chains require significant capital investments (CapEx) in production equipment and facilities, all of which are vitally important to improve the competitiveness and future positioning of firms.

And, with the global economy set for a significant reset while the world grapples with the significant increase in financing costs, embarking on 'cost out' projects has become an essential activity in order to survive.

But how can capital investments be defined using a 'best practice' target-costing approach, while also being achieved in a sustainable manner?

We deliver performance. At speed...

We create opportunity from complexity. Yes, cost optimisation is complicated, but it also offers clear opportunities to increase margins, gain new product insights and unleash innovation.

We deploy our extensive experience and knowledge to help organisations, across many different sectors, understand exactly which levers they need to focus on, in order to be as effective as possible.

Having completed hundreds of investment cost optimization projects, we know that there's a clear, well-defined formula for success. The following slides illustrate our rigorous approach to optimizing costs of capital goods (CapEx) for production.

If you're looking to make significant savings in your capital goods spending, we can definitely help...

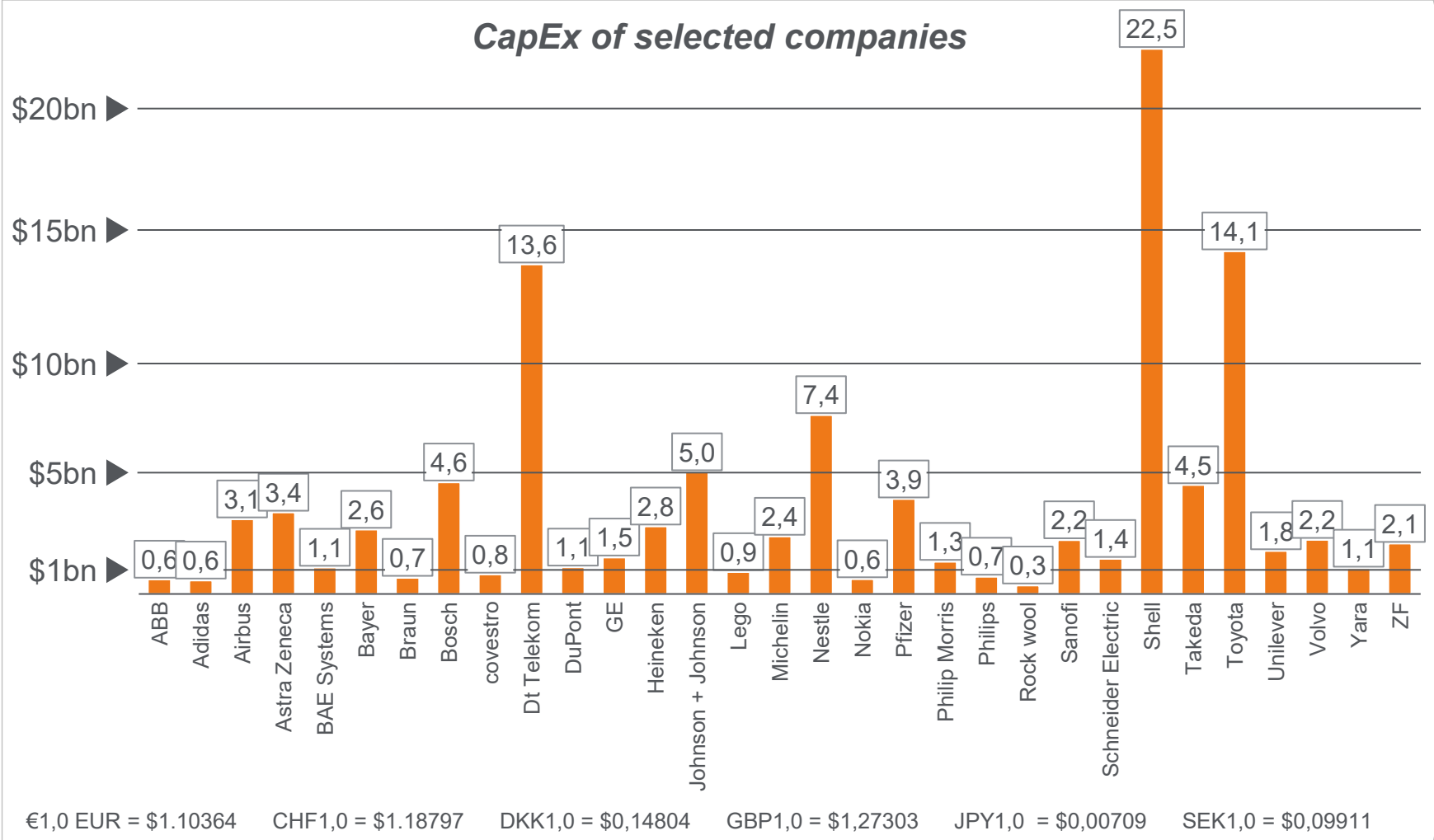


Holger Peterkord
Senior Principal



Roger Ryf
Principal

Increasing capital expenditures for transformational activities, and rising interest rates, are hurting cash flow and profitability



EFESO insight

- **Companies** have to make **significant investments**, driven by **transformations** such as **digitization**, **net zero regulations** and **electrification**
 - **Financing costs** have **increased +185%*** and are expected to remain at a high level
- **‘Money’ is becoming scarcer** and the pressure on investment projects is increasing



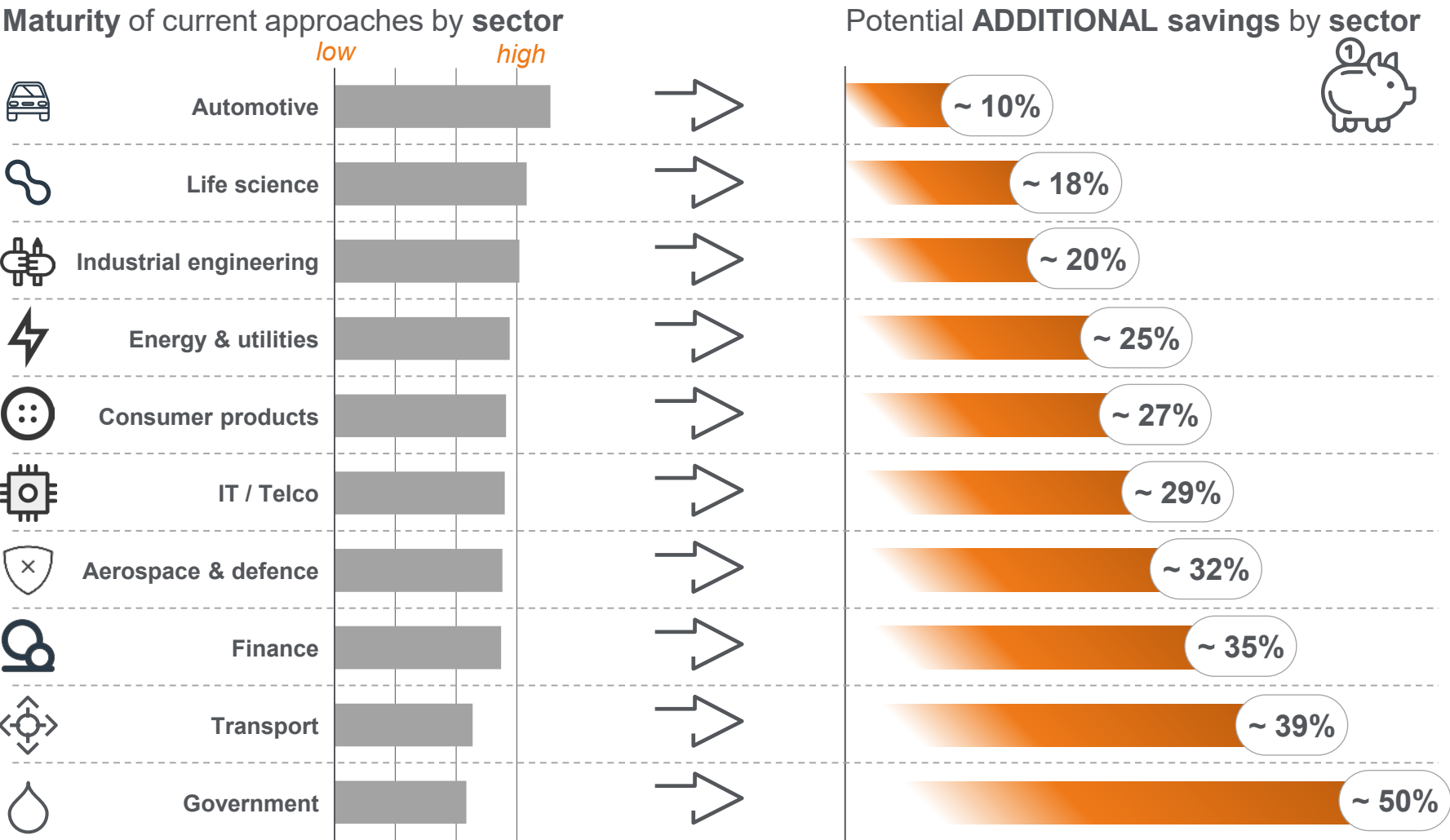
Source: EFESO research, annual reports; *ECB: European Central Bank - cost of borrowing for corporations in Euro area 02/22 vs 12/23: 1.83% to 5.22% p.a.= 185% increase

Our benchmarks show: there are opportunities to reduce CapEx and save cash

Our research shows that there are substantial, unexploited cost savings opportunities in all sectors, with some amounting to as much as 30 to 50 percent of outlay.

Our graphic shows how the various sectors are performing.

The potential savings that can be achieved by installing a best-in-class approach are easily demonstrated in our client case studies.



Increasing innovation, along with growing technological breadth and complexity, represent both an enormous challenge for procurement, and a key success factor

Drivers

- Globalization
- New markets
- Innovation
- Production at 'low cost' locations
- R&D in 'best cost countries'
- Productivity
- Economic efficiency
- New technologies
- Sustainability (ESG)
- Energy efficiency
- Transportation costs

CAPITAL GOODS



Challenges

- Worldwide procurement
- Specific local requirements
- Legal requirements
- Trade impediments (pandemic, war, etc.)
- Complexity & range of technologies to be covered
- Knowledge of the procurement market
- Creation of the necessary cost transparency
- Limited financial possibilities (rising costs of credit financing)

We cover all capital expenditures on the balance sheet: property, plant & equipment (PPE)

Buildings



Technical building services



Material handling



Machinery & equipment



- Civil engineering
- Land development
- Site preparation
- Foundations
- Roads
- Parking areas
- Buildings
- etc.



- Heating, ventilation & air conditioning
- Fire protection
- Low voltage system
- Communication and IT networks
- Building automation
- etc.



- Overhead conveyors (EMS, P&F)
- Floor conveyors (chain, roller, slat, skillet, etc.)
- Automatic guided vehicles
- Automatic storage & retrieval systems
- etc.

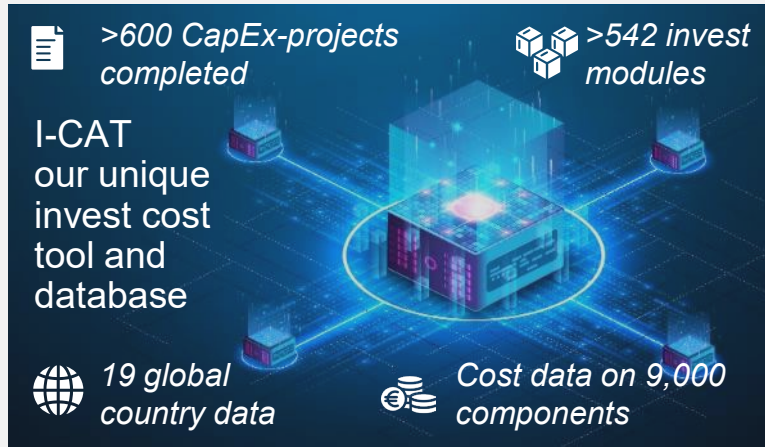


- Machine tools
- Assembly lines
- Heat and surface treatment facilities
- Test benches
- Tooling
- Process equipment (piping, columns, tanks, pumps, etc.)
- etc.



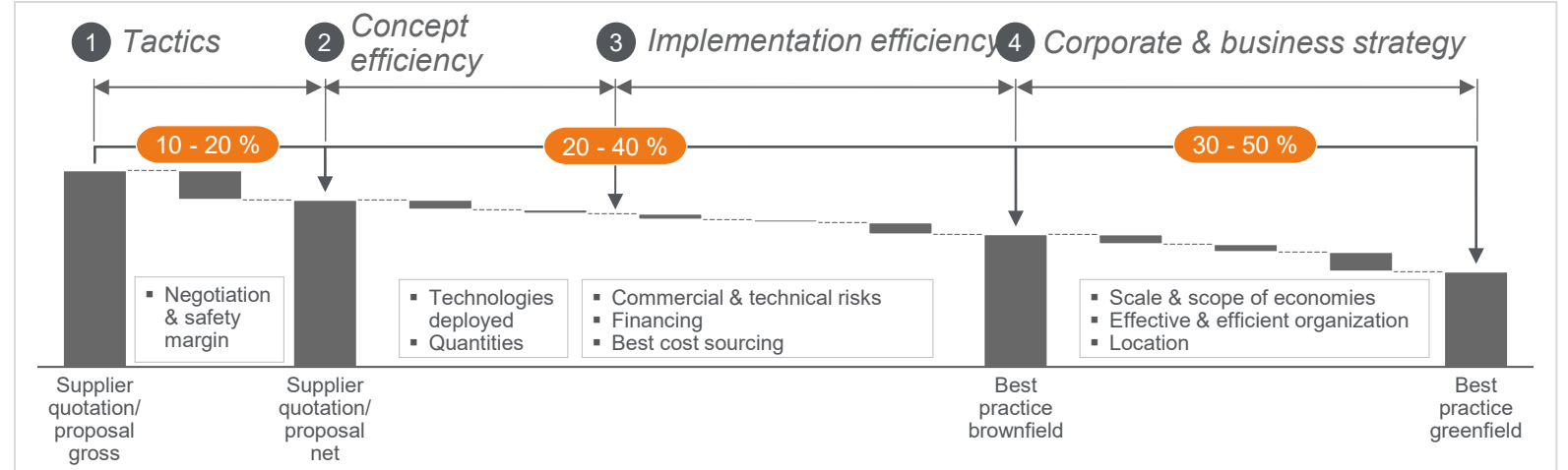
Using our unique 'invest cost' tool, database and approach can help significantly reduce CapEx outlay

What makes us unique?



- The world's largest CapEx database, covering key industry sectors
- Analysis and optimization of work breakdown E2E, based on specifications and/or supplier quotes
- Our technical cost-analysis capability can address a single invest item, a production line, or entire factory sites

Outlining saving opportunities



A prime candidate for optimization...

PROJECT EXAMPLE

New unique 30 MW test bench for gearboxes, to simulate torque and non-torque loads:

- Deep understanding of technical & commercial cost drivers
- Structured and detailed workshops with suppliers and manufacturing engineering
- Total Cost evaluation, based on simulation and comparison of water & energy consumption over the life cycle, to compare different supplier concepts
- Collaboration between purchasing, manufacturing engineering and EFESO team

-10% CapEx cost reduction
-12% reduced power & water consumption over lifetime

Totally integrated procurement of machinery & equipment provides lowest cost for both the buyer and to the environment

Sustainable approach to balance CapEx and OpEx

CapEx (Capital expenditures)

EFESO's

Invest costing & analysis tool (I-CAT)
advanced edition

I-CAT ADV R2.41

Top 20 Kostentreiber			
Rang	WBS	Kosten	Anteil
1	0-0007-5.3 Interieur	1.947.611 €	8,3%
2	0-0009-5.3 Produkt Design (z.B. Non-Standard-Teil) R&D	1.796.240 €	7,5%
3	0-0009-5.3 Non-Standard-Teil	1.740.243 €	7,4%
4	0-0002-5.4 Hydraulic Cylinder and Block valve, valves and actuator	1.512.220 €	6,4%
5	0-0007-5.3 BGR	1.511.941 €	6,4%
6	0-0002-5.3 2p. Piston	1.408.738 €	6,0%
7	0-0010-1.1 Project Management	1.408.545 €	6,0%
8	0-0007-5.3 Dose	1.361.184 €	5,8%
9	0-0003-5.4 Motor	1.453.107 €	6,3%
10	0-0004-5.3 BGR Hydraulic System	1.420.210 €	6,1%
11	0-0007-5.3 BGR	1.366.105 €	5,8%
12	0-0009-5.2 1p. Inlet & Discharge for PTH heating coil	1.313.230 €	5,7%
13	0-0003-5.4 Motor	1.226.119 €	5,2%
14	0-0009-5.3 Two-Block Main Foundation	1.214.833 €	5,1%
15	0-0005-5.4 Motor with adjustment unit	1.137.395 €	4,9%
16	0-0010-5.2 Control System & Control Tower	1.124.047 €	4,8%
17	0-0003-5.2 2p. Support Unit (Mobile Boiling)	1.122.277 €	4,8%
18	0-0009-5.3 2p. Inlet & Discharge System	1.113.140 €	4,7%
19	0-0004-5.4 2p. Cooling	1.048.693 €	4,5%
20	0-0008-5.3 Project Management R&D	1.044.723 €	4,5%
	Total	23.123.744 €	10%

ABC-Analyse			
WBS	Anteil	Anteil	Anteil
A	19.371.371 €	83,7%	10 Items
B	13.705.651 €	59,3%	17 Items
C	23.123.744 €	100,0%	24 Items
	23.123.744 €	100,0%	24 Items

Kostenverteilung			
WBS	Anteil	Anteil	Anteil
1	1.947.611 €	8,3%	27 Items
2	1.796.240 €	7,7%	13 Items
3	1.740.243 €	7,5%	11 Items
4	1.512.220 €	6,5%	8 Items
5	1.511.941 €	6,5%	8 Items
6	1.408.738 €	6,1%	9 Items
7	1.408.545 €	6,1%	8 Items
8	1.361.184 €	5,8%	6 Items
9	1.453.107 €	6,3%	10 Items
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	23.123.744 €	100,0%	24 Items

ABC-Analyse Schwellexe			
WBS	Anteil	Anteil	Anteil
A	2,00%	1.188.516 €	5%
B	10,00%	2.148.240 €	9,3%
C	90,00%	2.041.988 €	88,7%
	23.123.744 €	100,0%	100,0%

Gesamtergebnis	
WBS	Anteil
A	1.437.777 €
B	1.113.140 €
C	7.572.827 €
	10.123.744 €

TCO (total cost of ownership)



- Concept as well as processes and technologies, determine cost, utilities and consumables as well as CO₂e emissions
- As a result, these interdependencies must be balanced so as to minimize cost for both buyer and to the environment



OpEx (operating expenses)

EFESO's





CO₂e calculation & analysis tool (C-CAT)
advanced edition

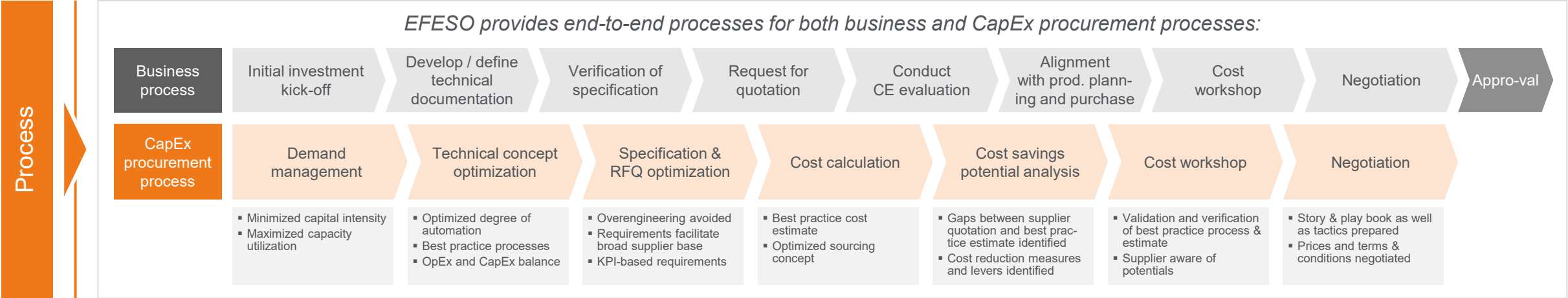
C-CAT ADV R1.00

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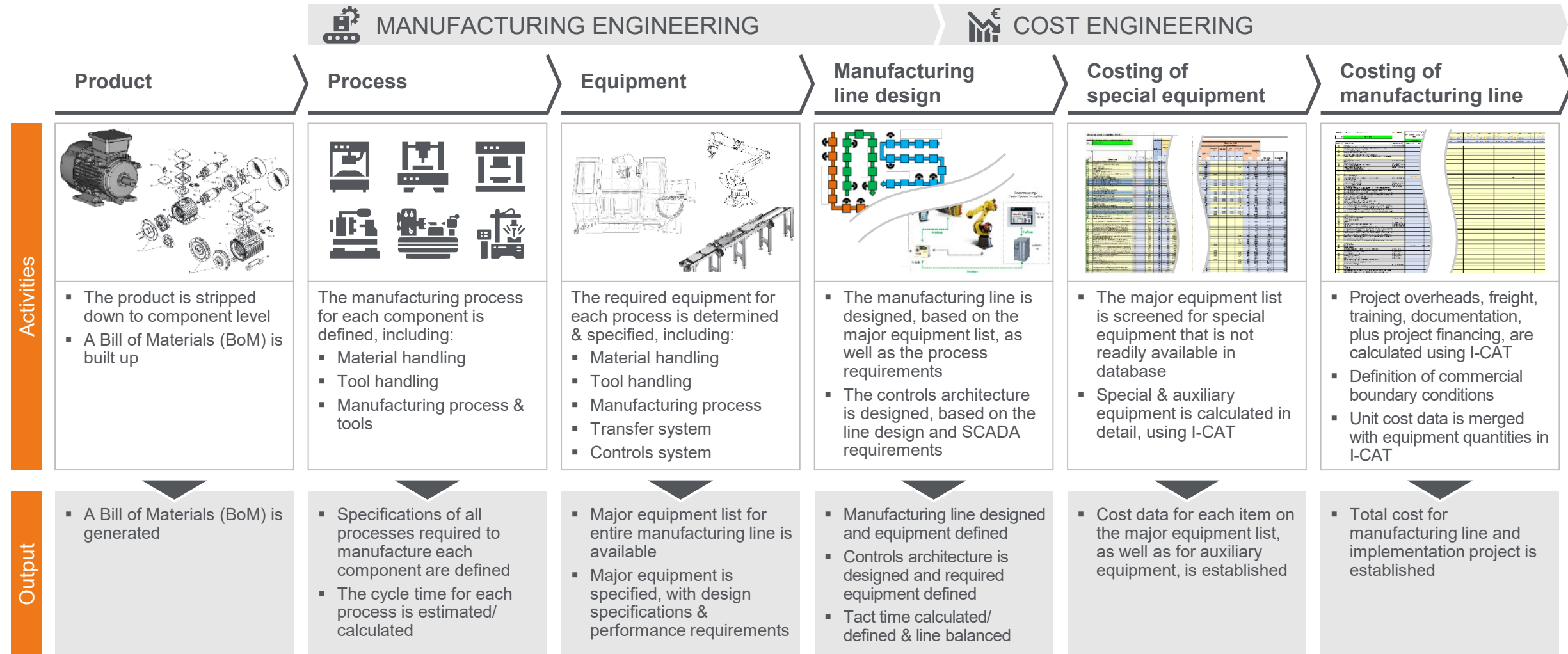
I-CAT and C-CAT enable and facilitate sustainable procurement of machinery & equipment, minimizing the cost of ownership and externalities.

The scope and benefits of EFESO's tools & database, as well as our process know-how

Tool & database	 I-CAT	 No. of data sets	 No. of single comp. cost data	 Country Data
	<ul style="list-style-type: none">Proprietary cost calculation toolCalculation tool incl.<ul style="list-style-type: none">RBS-AnalysisWBS-AnalysisCSP-AnalysisPer diem-rate calculationMachine-rate calculationFabrication-cost calculationetc.	<ul style="list-style-type: none">542 pcs. complete data sets incl. material & laborWith these data sets, machinery & equipment can easily be configured, rather than calculatedIncludes 1.700 pcs. single component cost dataCost data inquired every 3 years (adjusted for annual inflation)	<ul style="list-style-type: none">9.113 pcs. single component cost dataThese include cost for machine tools, robots, mechanical, pneumatic and electrical components as well as complete systemsCost data inflated annually, based on a composite indexRandom sample of price level for selected items	<ul style="list-style-type: none">19 pcs. country data (hourly rates)This data includes hourly rates for 18 different qualifications, i.e., 342 pcs. hourly rates in total for the calculation of the value addedLabor cost data researched every 3 years (adjusted for annual inflation)



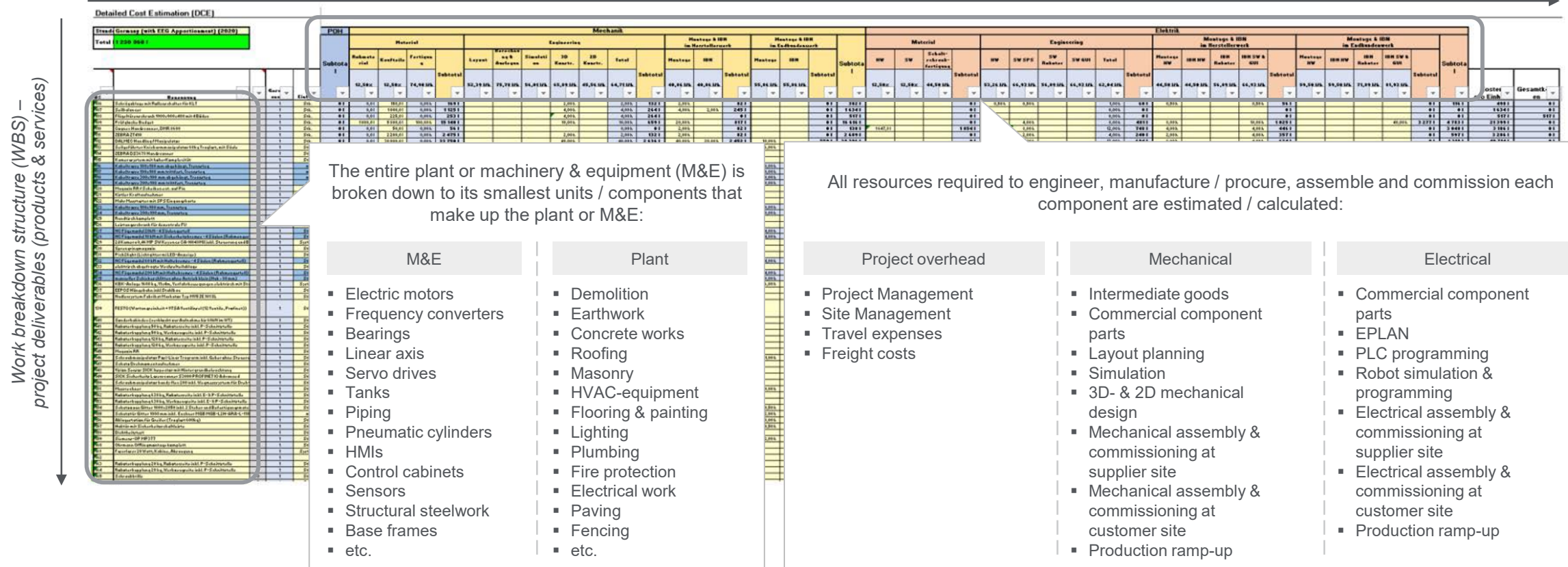
Our six-step approach to developing an effective & efficient manufacturing line to achieve best total cost



Cost estimation & calculation of deliverables – resources* required are estimated / calculated in the resource breakdown structure (RBS)

WBS – RBS matrix to estimate / calculate required material & labor

Resource breakdown structure (RBS) – resources required to manufacture / render products / services



*Resources include labor and material for both mechanical & electrical engineering, manufacturing, assembly, and commissioning as well as project overhead

With cost structure analysis, the primary cost drivers, in terms of both resources and deliverables, can be clearly identified

Resource breakdown structure (RBS)

POH		POH	Zukauf	Leistung	Rate	Kosten			
POH	POH	Leist.	Rate	Rate	Rate	Rate	Rate	Rate	
Mechanik	Material	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
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		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%		
Elektrik	Material	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
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		276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%
276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%	276.457 €	17,8%		

RBS analysis

- Validation & verification of project cost
- Identification of cost drivers, in terms of resources, functions, and disciplines
- Sensitivity analysis, pertaining to hourly rates & markups

Work breakdown structure (WBS)

Top 20 Kostentreiber WBS			
Rang	WBS	Kosten	Anteil
1	1001 Projektmanagement & Bauleitung	206.085 €	16,2%
2	328 Schraubspindel Bosch BG2, Gerade 1,2-10 Nm, inkl. Haltekonsole und Einzel	125.768 €	10,2%
3	Roboter 3 Stäubli - DX2 90 mit Steuerung CSI, 6 Achsen	111.869 €	9,1%
4	006 Projektmodul Automatikmodul	95.334 €	7,7%
5	040 Bosch Transfersystem T52	90.523 €	7,4%
6	007 Schaltschrank für Voll- & Halbautomatik - Stationen	84.983 €	6,9%
7	520 NC-Frägmodul 20kN - C Pressengestell	77.529 €	6,3%
8	Roboter 2 Fanuc - SR30A-300-C-PN/3 - Scara	64.282 €	5,2%
9	281 Stöger Zange / Schraubenaufnahme bei Direktführung	59.789 €	4,9%
10	008 Bedienpult	46.925 €	3,8%
11	282 Stöger Zuführung 4- bzw. 5-fach	40.474 €	3,3%
12	2160 Traystapler (Stapelringsabstapler) Paletten andienen Isore Paletten stapeln	40.071 €	3,3%
13	284 3d Kamerasystem Fa. IDS	32.721 €	2,7%
14	286 2d Engenev Kamera 7807	22.011 €	1,8%
15	189 NC-Achse geföhrt mittel (Hub = 500 mm)	17.845 €	1,4%
16	188 NC-Achse geföhrt klein (Hub = 250 mm)	17.293 €	1,4%
17	253 stationärer DMC-Scanner, SR-2000 Keyence	15.601 €	1,3%
18	129 2d Kamera IL46 MP SW Keyence CA-H14RMX inkl. Steuerung und Relaisbuch	14.950 €	1,2%
19	307 Kugelführung Schwerkraft	12.422 €	1,0%
20	1004 Fracht & Verpackung	10.267 €	0,8%
Total		1.185.995 €	96%

WBS analysis

- Identification of cost drivers
- Pareto-analysis to assess accuracy of total project cost
- Validation of costing approach



Our potential cost-savings calculations & competitiveness analysis allow the root causes of a lack of competitiveness to be easily identified

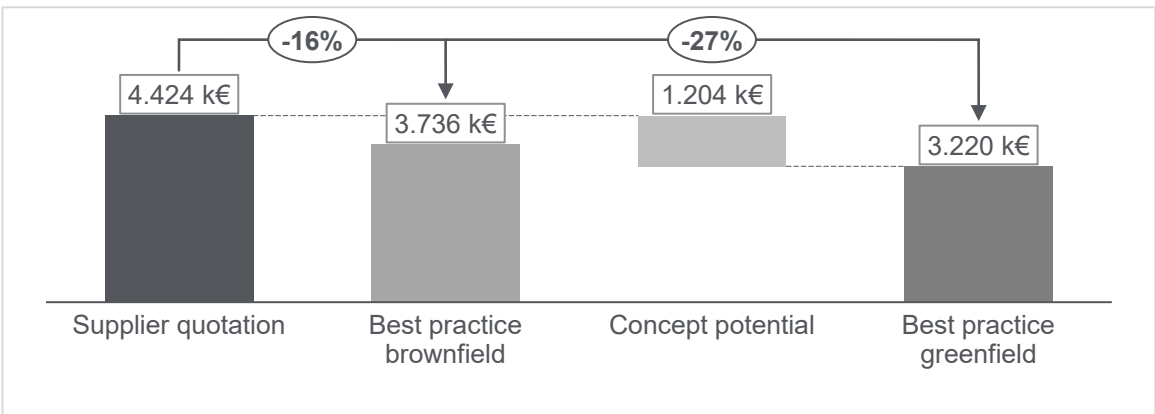
Deliverables that are not competitively priced

Cluster	Bezeichnung	Lieferant	TC	CSP	CSP	CSP-Rang
Total (EUR)		5.395.900	3.840.716	1.555.184	28,8%	
Main Line	CE-E Station 10 - VM Kühlerbaugruppe	162.500	50.508	111.992	68,9%	7
Main Line	CE-E Station 20 - Schrauben Kühlerbaugruppe	361.500	177.162	184.338	51,0%	2
Main Line	Station 10 - VM Deckel groß/ IO Verpackung	224.000	67.251	156.749	70,0%	4
Main Line	Station 16 - Back up Schraubplatz	0	34.104	-34.104	0,0%	98
Main Line	Station 30 - Schrauben Deckel groß	310.500	185.083	125.417	40,4%	5
Main Line	Station 50 - HAP Montage Flexfolien	117.000	46.675	70.325	60,1%	9
Main Line	Station 55 - Back up Schraubplatz Flexfolien	0	35.611	-35.611	0,0%	99
Main Line	Station 60 - Schrauben Stecker Flexfolien	198.000	147.591	50.409	25,5%	15
Main Line	Station 70 - Kolbenlöten Flexfolien	152.000	134.791	17.209	11,3%	20
Main Line	Station 90 - AOI	152.500	163.184	-10.684	-7,0%	91
Main Line	Station 100 - Auftragen Berührschutz	194.500	162.768	31.732	16,3%	19
Main Line	Station 120 - Dichtprüfung	96.667	38.477	58.190	60,2%	12
Main Line	Station 130 - Funktionsprüfung 1	96.667	46.335	50.332	52,1%	16
Main Line	Transfersystem & WT	484.000	471.355	12.645	2,6%	23
Main Line	Kommunikation	0	22.971	-22.971	0,0%	96

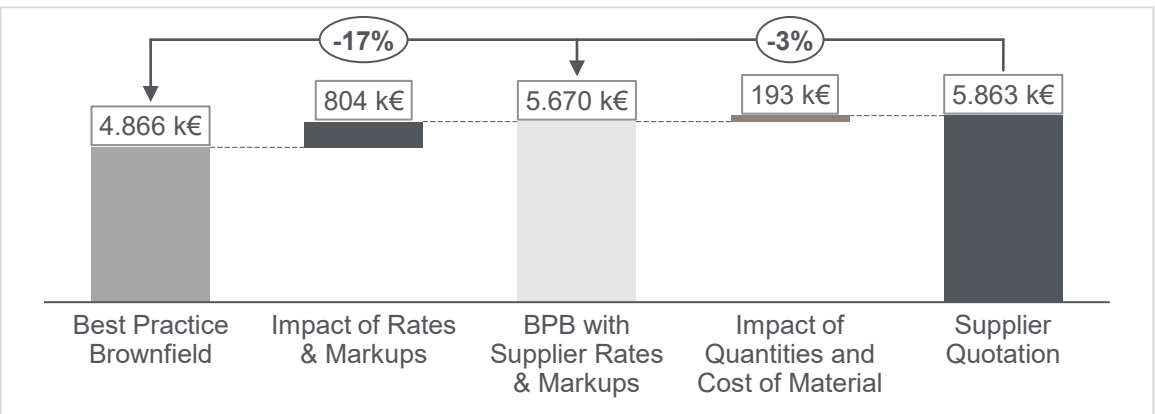
Result of the analysis

- Assessment of the competitiveness of the supplier in terms of company cost-level
- Assessment of the cost efficiency of the supplier's concept
- Identification of individual deliverables that are not competitively priced

Supplier concept not competitive / efficient



Company cost-level not competitive



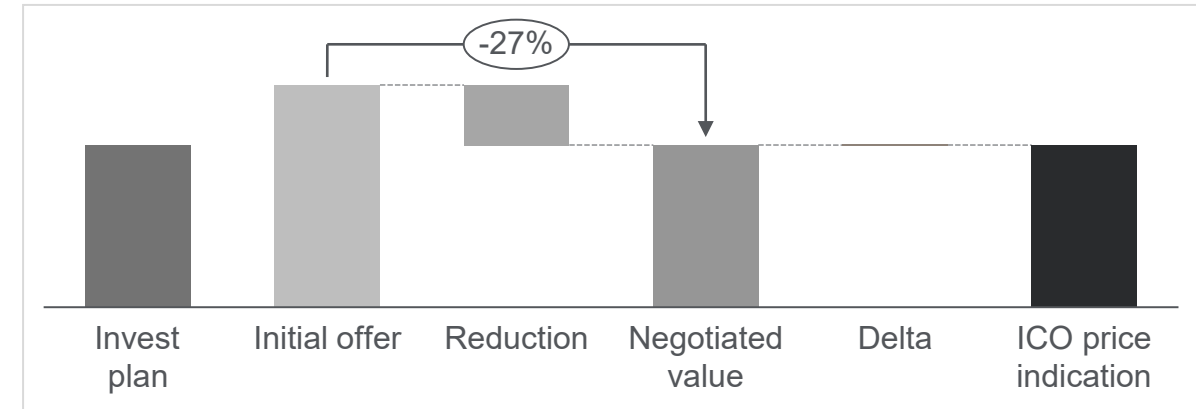
Our 'design-for-value' approach led to savings of 27% for a cigarette packing line that needed to match a competitors' price level

Description of Investment

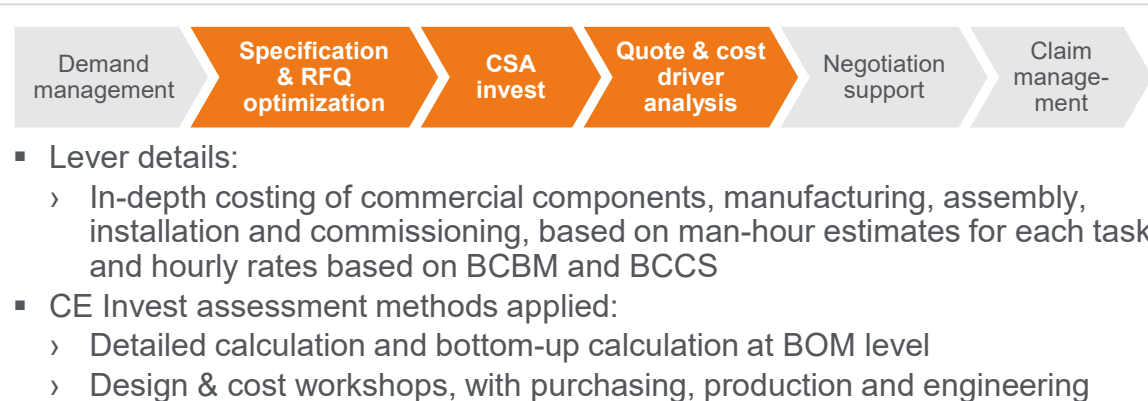
- Description of CapEx project:
 - › Cigarette packing line consisting of packer, wrapper and cartoner / over wrapper for 500 - 600 parts per minute
- Technologies deployed:
 - › Controls & safety technology
 - › Servo drives
 - › Tooling
 - › Material handling



Results (cost situation, in €m)



Approach



Success factors

- Success factors in the project:
 - › Deep understanding of technical & commercial cost drivers and interrelationships
 - › Detailed, intensive workshops
- Collaboration of all parties involved:
 - › Purchasing
 - › Manufacturing, Engineering and Production
 - › Engineering

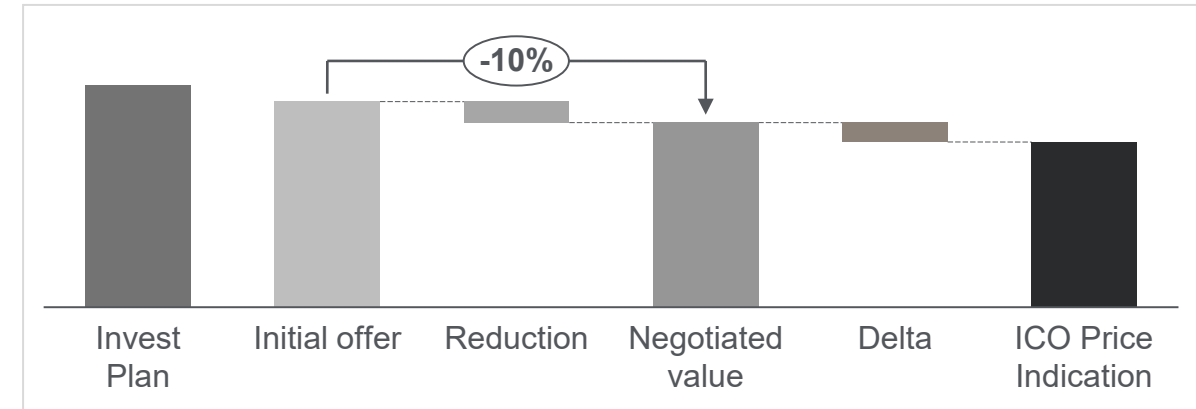
Our 'best-cost' concept for carbon-fiber materials filling equipment led to savings of 10% with a single source supplier

Description of investment

- Description of CapEx project:
 - › Cigarette packing line consisting of packer, wrapper and cartoner / over wrapper for 500 - 600 parts per minute
- Technologies deployed:
 - › Controls & safety technology
 - › Servo drives
 - › Tooling
 - › Material handling



Results (cost situation in €m)



Approach



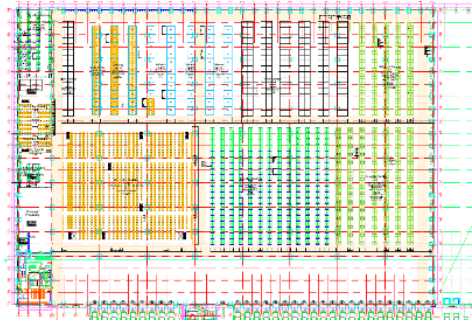
Success factors

- Success factors in the project:
 - › Deep understanding of technical & commercial cost drivers and interrelationships incl. supplier cost structure & level analysis
 - › Detailed, intensive workshops with supplier
- Collaboration of involved parties:
 - › Purchasing
 - › Production planning / manufacturing engineering
 - › Cost engineering

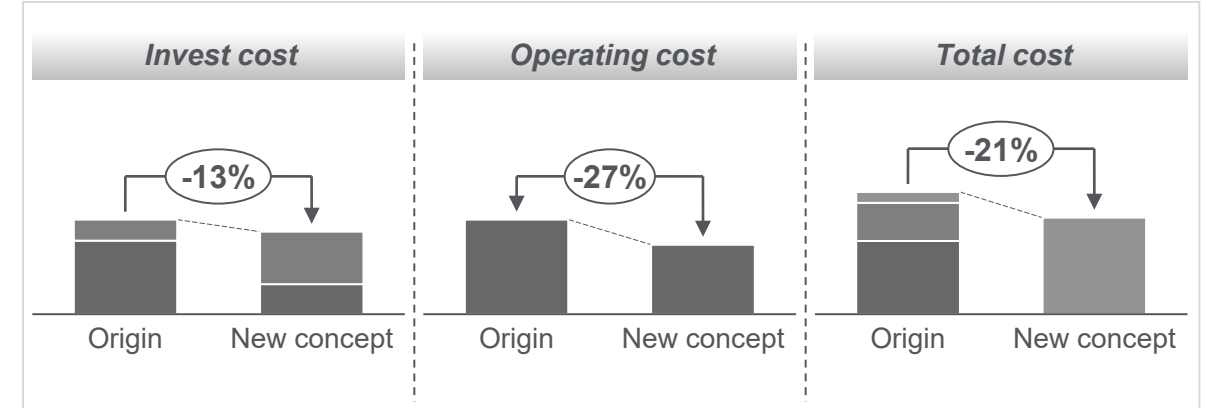
Our 'total cost of ownership' approach led to savings of 13% in CapEx, 27% in OpEx and 21% in total, respectively, for a spare-parts logistics center

Description of investment

- New logistics center for worldwide spare-parts supply
- Change from manual handling to semi-automated commissioning system (*from 'man to part' to 'part to man'*)



Results (cost scenario in €m over a lifetime of 7 years)



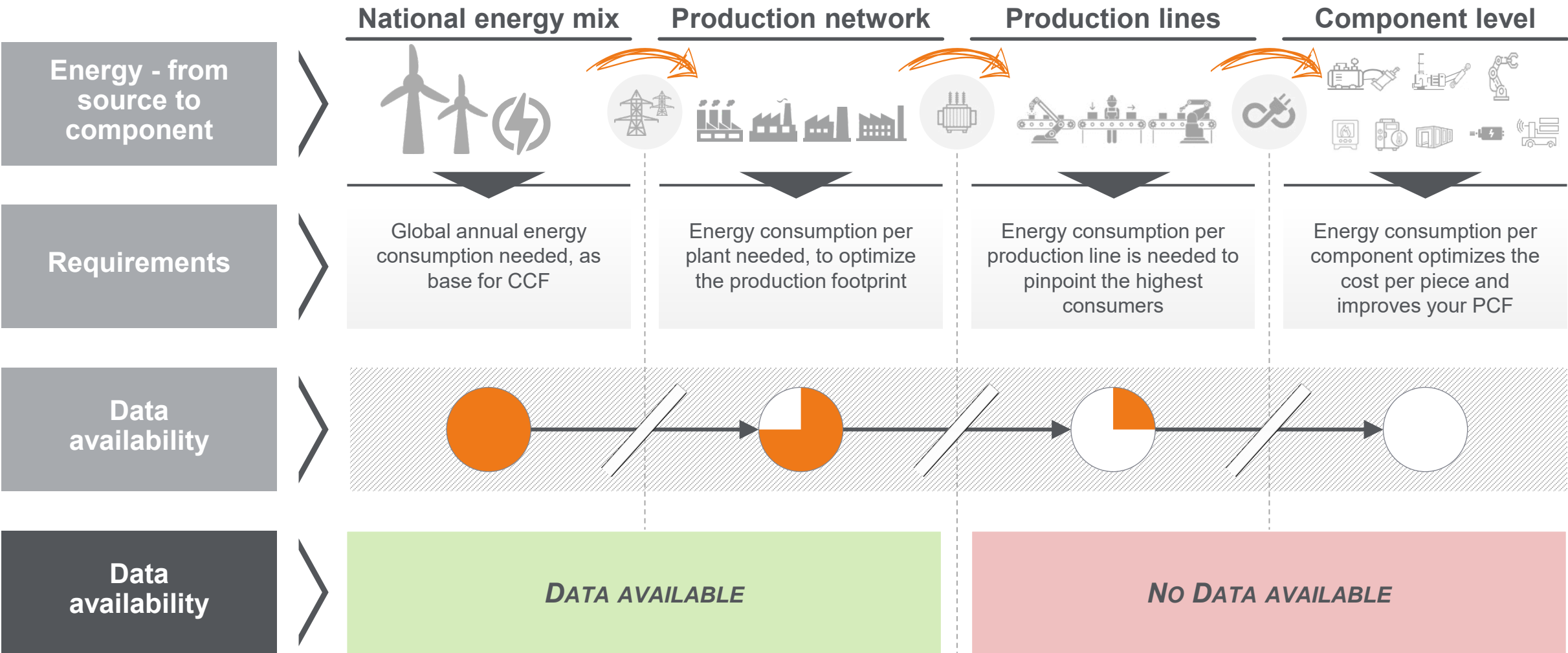
Approach



Success factors


- Success factors in the project:
 - › Rationalization ideas developed by EFESO to optimize labor intensity and, finally, the total cost
 - › Market research on technical equipment
 - › EFESO's special expertise
 - › Transparency on current cost situation


EFESO's analysis shows that transparency on energy consumption usually stops at plant level, missing out invaluable data from millions of production lines globally





We help our clients create transparency, and show the way forward to accurately establish footprints, from a single consumer all the way up to global production


EFESO capabilities


**C-CAT tool & database**

**28 emission factors**


**167 consumption modules**

**40 global country data**


**600 completed ICO projects**

**Direct linkage to costing & performance**


Our approach to creating transparency




We calculate the energy & power consumption of machines & equipment from process requirements



We calculate energy consumption, based on basic laws of physics (electrical, fluid, mechanical, thermal)

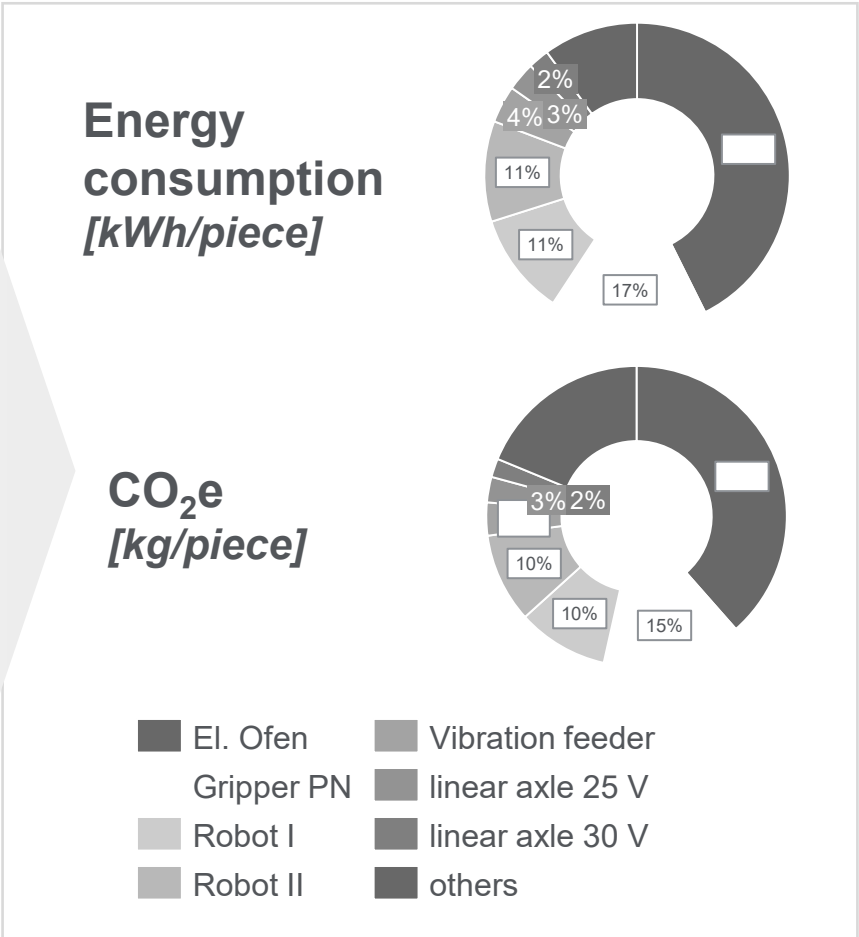


We derive scope 1 & 2 emissions for machines & equipment on actuator level



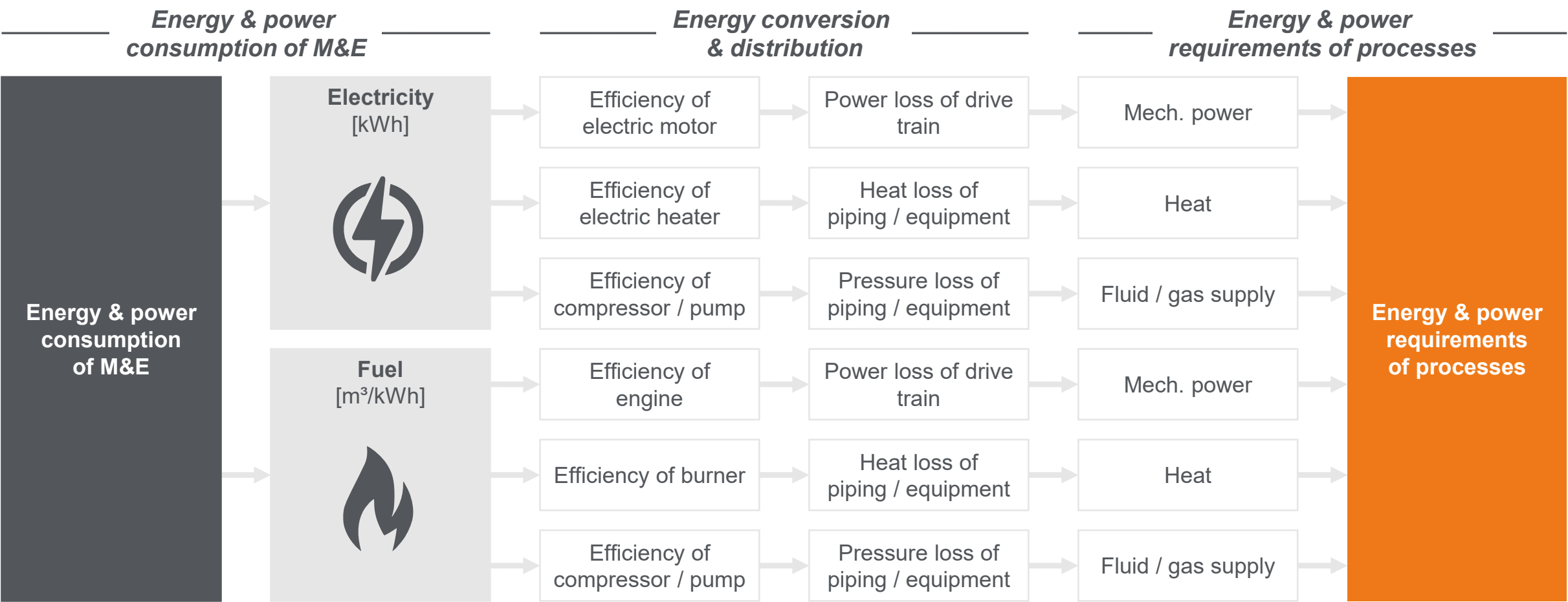
We identify the major drivers of energy consumption and cost, as well as CO₂e

Project example – a powertrain assembly line



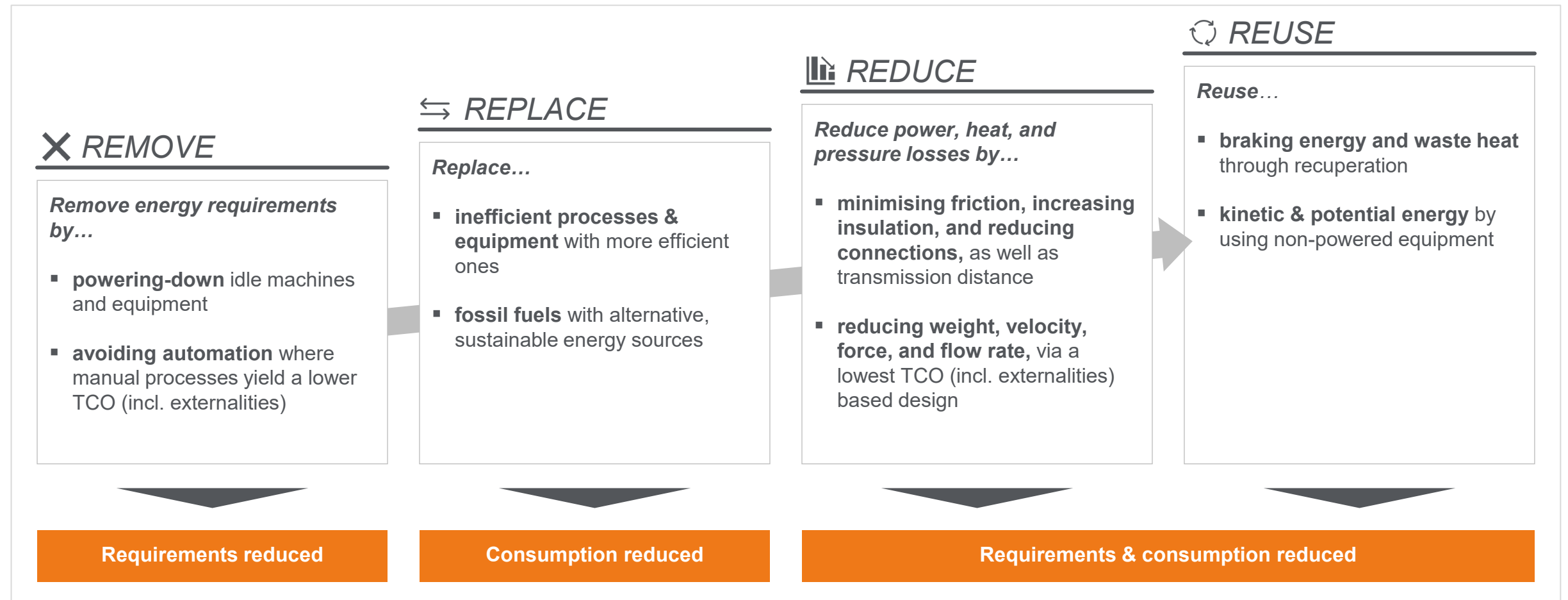
The energy & power consumption of Machines & Equipment (M&E) is derived from the process requirements, taking efficiencies into account

Calculation methodology of energy & power consumption of M&E



It's all about effectiveness & efficiency... from power generation to consumption

Our '4R' approach to reducing energy consumption and CO₂e emissions

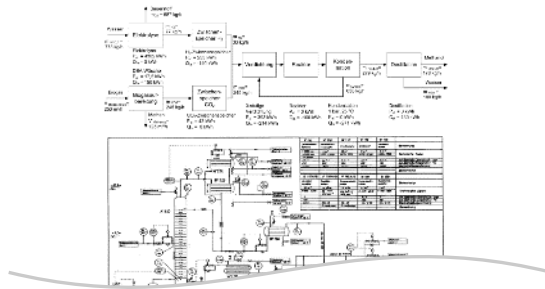


Our EBS analysis identifies both energy consumption and CO2e emission savings potentials

Equipment breakdown structure (EBS) analysis for process plants

P&ID

energy & mass balance



P&I diagram as well as process energy & mass balance define the baseline for the energy consumption of the plant

Equipment list

Item No	Description	Area	Length/ Height	Dia	Arrgt Drg No
1071-B	Stack	18	165	0.5	B0108 B 001
1071-C	H.P Heat Exchanger	18	12	2	C1021 C 001
1072-C	H.P Condenser	18	20	1.5	C1022 C 001
1073-C	H.P Scrubber	18	7	1	C1023 C 001
1024-C	Abs. Circ. Cooler	16	6	0.5	
1031-C	Heater Recirculation	17	7	1	C1031 C 001
1032-C	P. Circ. Cooler	16	6.5	1.3	C1032 C 001
1033-C	L.P Scrubber Circ Cooler	16	1 x 1	0.9	C1033 C 001
1041-C	1st Evaporator	10	5.2	1	C1041 C 001
1042-C	2 nd Evaporator	10	3	0.7	C1042 C 001
1071-C	Flash Tank Condenser	16	0.7	0.75	C1071 C 001
1072-C	1 st Evaporator Condenser	16	7	1.3	C0172 C 001
1073-C	1 st Cond. 2 nd Evaporator	17	5	0.7	C1073 C 001
1074-C	2 nd Cond. 2 nd Evaporator	18	5	0.5	C1074 C 001
1075-C	After Condenser	16	5	0.5	
1076-C	Desorb. Heat Exchanger	18	1 x 1	0.5	C1077 C 001
1078-C	Waste Water Cooler	18	1.5 x 2	0.7	C1078 C 001
1080-C	Hydrosizer Heat Exchanger	18	9	0.75	C1080 C 004
1091-C	Heat Steam Cond.	18	4	0.8	C1091 C 001
1092-C	Circ. W. Cooler H.P Scrubber	18			
1093-C	Circ. W. Cool. H.P Cond.	18			

All energy consuming and distributing equipment is taken off the equipment list, which is based on the P&ID

Greenfield energy consumption

Top 20 - Energieverbrauch			
Rang	EBS-Code & Bezeichnung	Energieverbrauch	
1	042 - Laser (CO2) 2.500 W (Netto/Wirkleistung)	0,787 kWh	2,0
2	058 - Pneumatikzylinder II	0,467 kWh	14,7
3	055 - Greifler I (pneumatisch)	0,277 kWh	7,7
4	201 - Allgemein - lastunabhängig - Gebläse KÜHLSTRECKE 4,0	0,216 kWh	6,8
5	056 - Greifler II (pneumatisch)	0,204 kWh	6,4
6	064 - Elektrofön I	0,191 kWh	6,0
7	002 - NC-Füge modul - 30KN	0,176 kWh	5,5
8	057 - Greifler III (pneumatisch)	0,144 kWh	4,5
9	048 - Laser (Nett-YAG) 6.000 W (Netto/Wirkleistung)	0,139 kWh	4,4
10	159 - Siemens - Panel IPC - HM1 15"-24" - IPC477	0,104 kWh	3,3
11	09 - EC-Schraubspindel 50 Nm	0,080 kWh	1,9
12	059 - Pneumatikzylinder III	0,057 kWh	1,8
13	020 - Linearachse Baugröße 35 - elektrisch - horizontal		1,5
14	019 - Linearachse Baugröße 25 - elektrisch - horizontal		1,5

Energy requirements and losses are calculated based on the

- equipment list
- energy / mass balance

Energy / CO₂e savings potential

Cluster	Bezeichnung	Lieferant	TC	CSP	CSP	CSP-Rang
	Total (EUR)		3.395.900	3.840.716	3.555.184	28,8%
Main Line	GE 4 Station 13 - VM Kabinen/Fuel	193.500	50.168	111.993	68,6%	1
Main Line	GE 4 Station 20 - Schrauben Kabinen/Fuel	38.500	17.500	138	53,5%	2
Main Line	GE 4 Station 20 - VM Decken/Fuel 20 Verspannung	42.500	42.500	128	53,5%	3
Main Line	Station 18 - Back-Schraube/Fuel	0	24.004	14.101	58,8%	18
Main Line	Station 18 - Schrauben Deckel Fuel	44.500	44.500	125,417	46,6%	4
Main Line	Station 18 - VM Kabinen/Fuel	447.000	463.678	405.151	40,5%	5
Main Line	Station 18 - Back-Schraube/Fuel Frontend	0	35.823	45.631	60,6%	69
Main Line	Station 18 - Schrauben Deckel Fuel	138.000	104.460	104.460	75,8%	10
Main Line	Station 18 - Kabinen/Fuel Frontend	112.000	112.000	17.209	15,3%	20
Main Line	Station 20 - ACN	132.500	138.144	138.144	72,0%	81
Main Line	Station 20 - Auflagen Kabinen/Fuel	100.000	117.738	117.738	70,0%	82
Main Line	Station 20 - 120 - Deckung	38.468	18.077	18.000	46,8%	17
Main Line	Station 20 - 120 - Deckung Fuel 2	0	48.513	48.513	50,0%	19
Main Line	Station 20 - Kabinen/Fuel 2	484.000	571.511	516.641	74,3%	23
Main Line	Flammkabinen/Fuel	0	22.915	22.915	2,9%	92
Main Line	GE 4 Station 13 - VM Kabinen/Fuel	162.500	50.168	111.993	68,6%	10
Main Line	GE 4 Station 20 - Schrauben Kabinen/Fuel	161.500	177.102	138	53,5%	11
Main Line	Station 20 - VM Decken/Fuel 20 Verspannung	224.000	224.000	64.748	28,9%	24
Main Line	Station 18 - Back-Schraube/Fuel	0	24.004	14.101	58,8%	19
Main Line	Station 18 - Schrauben Deckel Fuel	335.500	335.500	125,417	46,6%	6
Main Line	Station 18 - VM Kabinen/Fuel	463.500	463.500	405.151	40,5%	6
Main Line	Station 18 - Back-Schraube/Fuel Frontend	0	35.823	45.631	60,6%	69
Main Line	Station 18 - Schrauben Deckel Fuel	138.000	104.461	104.461	75,8%	10
Main Line	Station 18 - Kabinen/Fuel	112.000	112.000	17.209	15,3%	23
Main Line	Station 20 - ACN	132.500				
Main Line	Station 20 - Auflagen Kabinen/Fuel	100.000				


Actual energy consumption is compared to greenfield consumption in order to identify energy / emission-savings potentials


Energy and CO₂e-intensive processes and equipment can effectively & efficiently be identified, and compared to actual consumption and generation, to identify energy / emission-savings potentials.

EFESO's approach, using its unique CO₂e / energy tool & database, significantly reduces operating costs

Overview of EFESO's methodology

C-CAT unique CO₂e & energy tool and database

 69 emission factors

 294 consumption modules

 41 global country data



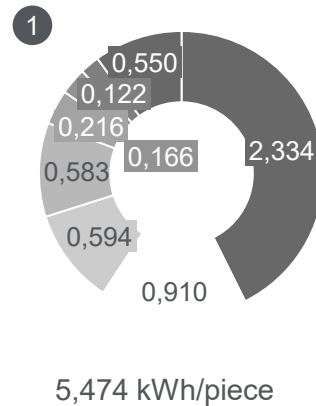
Scope 1 & 2 emissions are primarily calculated based on the basic laws of physics: i.e., independent of supplier-specific products:

Best Practice calculation of energy consumption and CO₂e emissions and costs based on latest status technology

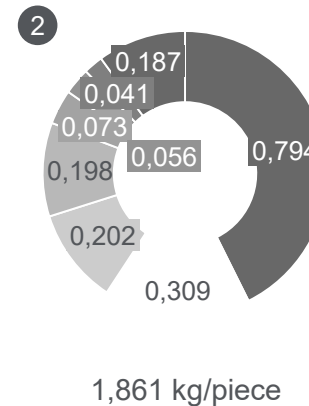
- **Analysis and optimization**, based on **equipment breakdown** and related **energy consuming processes**
- **Technical breakdown of machinery & equipment**, down to individual **units & components**
- Preparation of detailed **best practice calculation based on EFESO's unique tools & database**

Project example of a powertrain assembly line

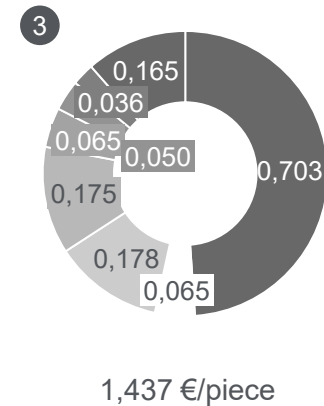
Energy consumption [kWh/piece]



CO₂e [kg/piece]



Energy cost [€/piece]



■ El. Oven
■ Gripper PN
■ Robot Type I
■ Robot Type II
■ Vibration feeder
■ linear axle 25 V
■ linear axle 30 V
■ others

Example of optimization levers

- Deep understanding of **technical & commercial cost-drivers**
- **Removal** of content through more efficient processes & concepts
- **Replacement** of pneumatic actuators with electrically-driven ones
- **Reduction** of number of robots through better material handling concepts
- **Reuse** of energy by regenerative braking



The first step... an on-site appointment to assess the existing situation and identify potential areas for CapEx reduction

I. On-site appointment
to assess the existing
situation



- Quick assessment of existing invest management and procurement processes
- Talk with clients from production engineering, controlling and procurement
- Identification of areas of improvement and possible pilot projects

1-2 day(s)

II. Piloting
of a 'specific invest
project' (bottom-up)



- Project selection based on greatest impact
- Setup of piloting team
- Execution of pilot, impact evaluation and estimate of overall benefit for client

4-6 weeks

III. Project
Holistic CapEx
optimization / reduction



- Blended top-down / bottom-up approach
- Top-down: CapEx avoidance, reduction, optimization, and timing
- Bottom-up: detailed cost engineering & negotiation approach including procurement support

12+ weeks

IV. Delivery & rollout
of 'CapEx reduction
program' globally



- Setup of global rollout team (factories, countries, regions)
- Execution of global rollout
- Tracking and reporting of deliverables and generated impact
- 'Lessons learned' feedback loops to optimize rollout program on the fly

12+ months

Our cooperative approach is guided by successful, proven principles

Our approaches...



...use processes tailored for our clients' challenging environments.

We have tailored our approaches to work with dynamic teams from different backgrounds.

While ensuring cross-functional collaboration, we will implement a clear and stringent performance management drive, decision-making, as well as ambitious target setting.



...come with a custom-made 'drum beat', to ensure constant progress.



...are a cooperative endeavour, to ensure sustainable project success.

We work as a team on an equal footing. We wield the know-how of renowned teams with proven industry expertise.
We help client team members to further build and improve their capabilities in cost and process optimization.

We focus on identifying and prioritizing cost savings opportunities, to ensure near-term product improvement.
We strive to deliver timely recommendations.



... lead to a fast achievement of the objectives.

EFESO is uniquely positioned to support clients with CapEx projects, thanks to its know-how, toolset, database and training

KEY success factors	In detail...	Ready-to-go
A We know products, manufacturing processes and technologies	We have worked with OEMs, Tier 1s and other industries for years, consistently delivering best-in-class results	<input checked="" type="checkbox"/>
	We have already conceived & deployed Cost Engineering processes successfully at our clients	<input checked="" type="checkbox"/>
	Our deep insights into processes & products allow us to swiftly get to grips with new situations and deliver results fast	<input checked="" type="checkbox"/>
B We know how to design machinery & equipment to minimize both CapEx & OpEx	We have relevant industry expertise in buildings, material handling and process technologies	<input checked="" type="checkbox"/>
	We know how to balance CapEx & OpEx to minimize Total Cost of Ownership including minimising the CO ₂ e footprint	<input checked="" type="checkbox"/>
	This allows us to easily apply our capabilities to many industries (e.g., food, chemicals, aerospace and defense)	<input checked="" type="checkbox"/>
C We have a proven methodology, tool and database	Our knowledge & experience is based on more than 10.000 consulting days and hundreds of projects	<input checked="" type="checkbox"/>
	Our methodology, toolset and database have been used for automotive OEMs, as well as Tier 1s and other industries	<input checked="" type="checkbox"/>
	Our proprietary tools (I-CAT & C-CAT) for capital goods are one of a kind, not available from anybody else	<input checked="" type="checkbox"/>
D We have implemented CE-invest methodology with multiple customers	Training & coaching of staff on-the-job: Based on our tools' (I-CAT & C-CAT) methodology	<input checked="" type="checkbox"/>
	There are no trial-and-error loops, because we have already developed a tried and tested toolset and database	<input checked="" type="checkbox"/>
	End-to-End know-how: Concept → calculation → analysis → cost workshop → negotiation	<input checked="" type="checkbox"/>

