



COST & VALUE ENGINEERING

INSIGHT

We will help you generate an appropriate cost and CO₂ target, based upon our unique costing knowledge and automotive experience

Global organizations cite cost reductions as a priority, but they're not doing enough

The automotive industry, like many other sectors, is facing the perfect storm: major market disruptions, production challenges, evolving technology trends and new legislation. The global economy is facing significant upheaval and as the world grapples with the effects of various crises, effective cost management has become vital to survival.

Although cost and value engineering are established functions within the automotive realm, existing capabilities and practices may no longer be sufficient. As the industry changes, so must cost and value engineering, e.g., to cover new cost categories, support agile development, expand knowledge of new technologies, and provide faster cost models.

As consultants, we have helped clients both establish and further develop cost and value engineering capabilities. We have guided numerous companies throughout the implementation process, from small pilots to large-scale rollouts.

Optimizing just one cost dimension is no longer sufficient. The effects of CO₂ reduction requirements exacerbate the situation!

EFESO has more than 20 years of experience in supporting clients in optimizing costs through a holistic approach, taking into account the interactions of individual cost items, such as:

- Product costs
- Machine and equipment investment costs
- Tooling investment costs
- CO₂ footprint and cost implications

We bring our leading technology and process expertise from working with leading automotive manufacturers on target setting and cost-improvement programs.

We have a unique track record of delivering world-class solutions, on which many of today's cost improvement programs are built.



Oliver Briegel Partner

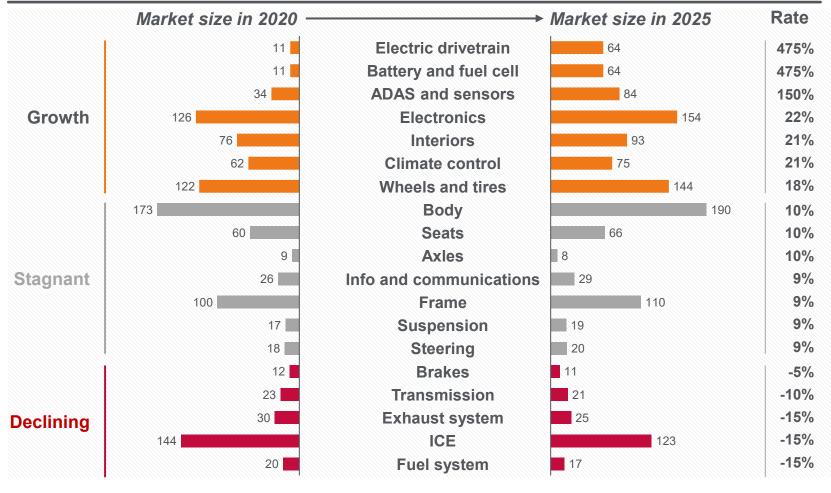


Torsten Malß
Director



While the balance may be shifting from 'old' to 'new', we see continued growth for both new and legacy segments during this period of automotive industry transformation

Automotive component segment size in \$B (2020 vs. 2025)



Implications

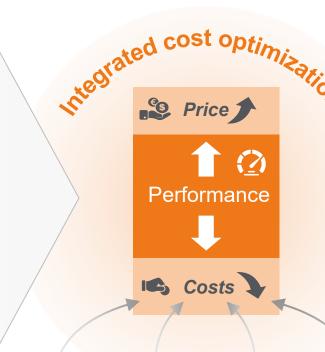
- A period of transition in the automotive industry is well underway, and will lead to huge changes within the global automotive supply industry
- However, this does not mean a general decline across <u>all</u> sectors; the impact of the transition period, on value creation and employment, will vary greatly, depending on the product areas
- While the shift towards electric mobility is likely to bring about significant declines in the drive/chassis-related product segments, certainly in comparison to current levels of value creation and employment, there should also be good opportunities for many other product segments to shore up their positions, with significant growth in many cases
- In this period of change, we see enormous opportunities for those who are strongly positioned, and are willing to act decisively
- Positioning well to win this new business while profitably delivering the existing portfolio – this is the challenge we see right now in automotive

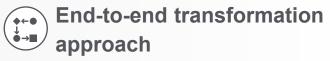
We are second-to-none in supporting our clients based on our unique combination of end-toend consulting solutions with proven and consistent ability to deliver



Data & analytics

- Process modelling skills and data access
- Holistic assessment of product, tooling and assets
- Technology skills to analyze sustainability / CO₂ footprint
- Innovative Al-based capabilities for costing and CO₂
- Scalability of services through innovative software platform





- Deep understanding of product, process and strategy
- Leading product-costing expertise
- Hands-on negotiation and implementation support
- Strong performance management skills





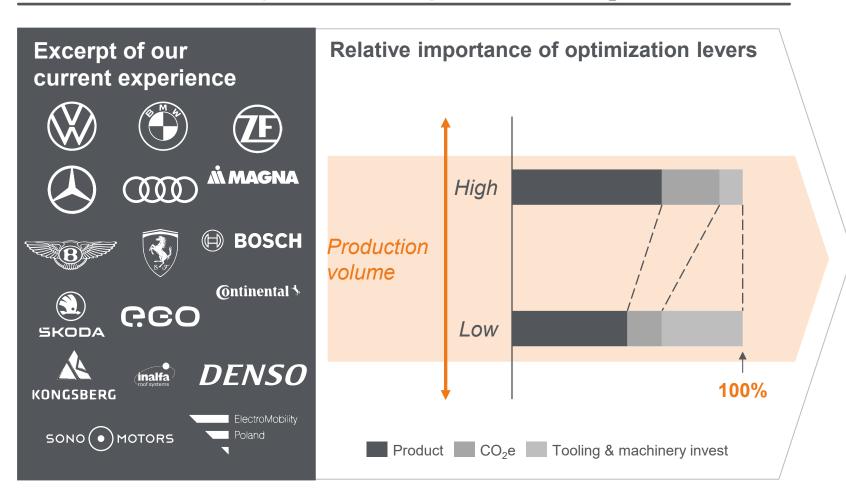
We are experienced in finding the optimum solutions in different volume scenarios for product, tooling and investment costs, with detailed evaluations of the impact of CO2 taxes.



This assures healthy margins as we combine our unique capabilities in product-, tooling-, invest- and CO2e cost, fully adjusted to the respective volumes



Our unique capability in cost-, tooling-, invest- and CO₂e



Our promise

We make large-scale profitability programs successful based on:

- Comprehensiveness, i.e., analysis of all optimization levers relevant for production volumes
 - → integrated product-, tooling-, invest- and CO₂e analysis
- **Granularity**, i.e., in-depth analysis on all technologies, processes, assumptions etc. across the supply chain
 - → key to win in complex supplier negotiations

The above capability is what makes us second to none in this field.



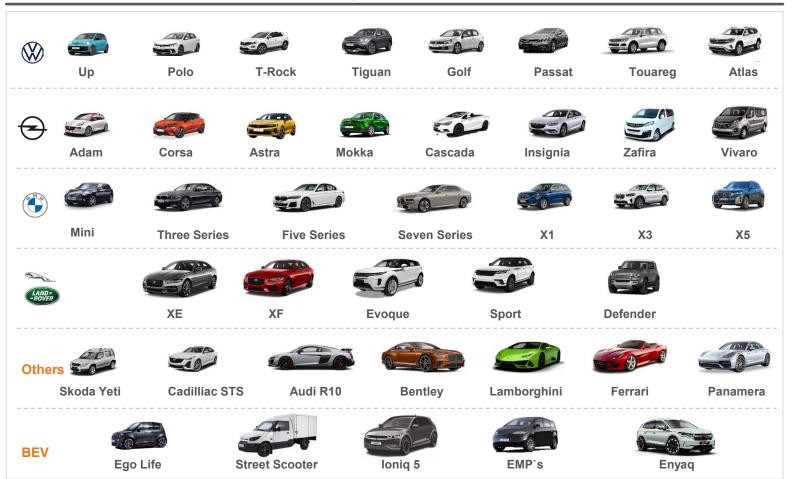
We are second-to-none in the field of parts, systems and vehicle costing, and have a long track record of successfully working with the world's leading companies

EFESO provides cost transparency to achieve best cost solutions



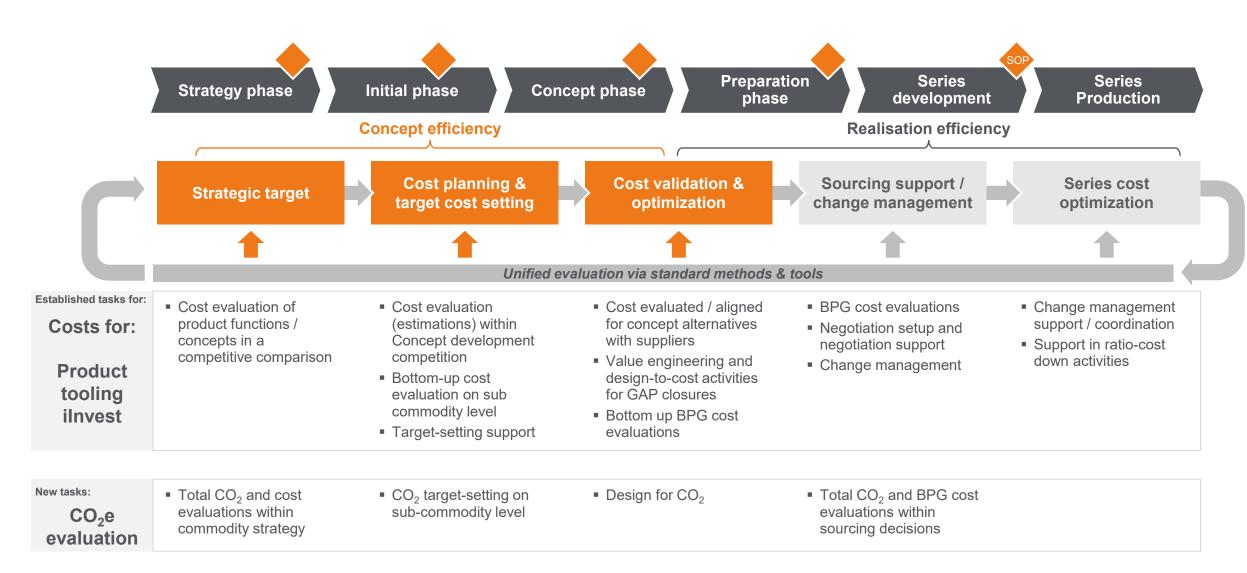
Why EFESO?

- Integrated cost transparency for all types of cost: product, tooling, investment, engineering, etc.
- Single source for E2E costing services, from concept selection, process definition, sourcing to installation and product launch
- Robust and mature cost information for both target setting and negotiation
- Long track record of holistic performance improvement programs
- Collaborative approach and proven strength in delivery



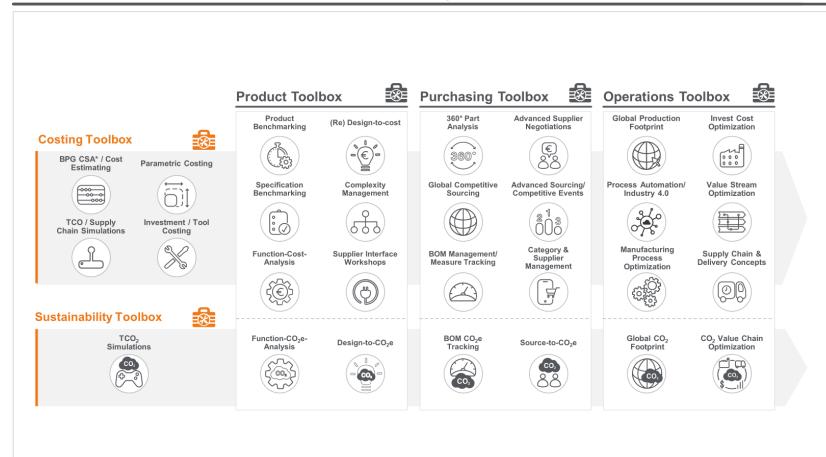


We analyze the product costs, investments and CO2 requirements along the product lifecycle, and then identify and deliver on value capture opportunities



EFESO provides a 'best practice' toolset to identify value capture opportunities and supports delivery via selected proven methods and procedures

We provides a 'tried and tested' profitability toolset



Why EFESO

- Based on more than 20 years of consulting experience, we have developed specific toolboxes, combined in an overarching approach, to improve the profitability performance of our clients
- These toolboxes allow a customizable combination of various methods in 5 general areas:
 - > Product costing
 - > Product design
 - > Purchasing
 - Operations & Supply Chain
 - Sustainability / CO₂
 - ... to unlock savings and improvements

EFESO is the ONLY consulting firm that fully integrates all drivers of success, i.e., the cost, investment and sustainability perspectives

Integrated optimization



Design-to-cost



Control and reduce product-cost during product development.

Develop cost-optimized products!



Design-to-invest



Add deep cost and technology knowledge on all aspects of tooling and invest.

Optimize plant-/machine invest!



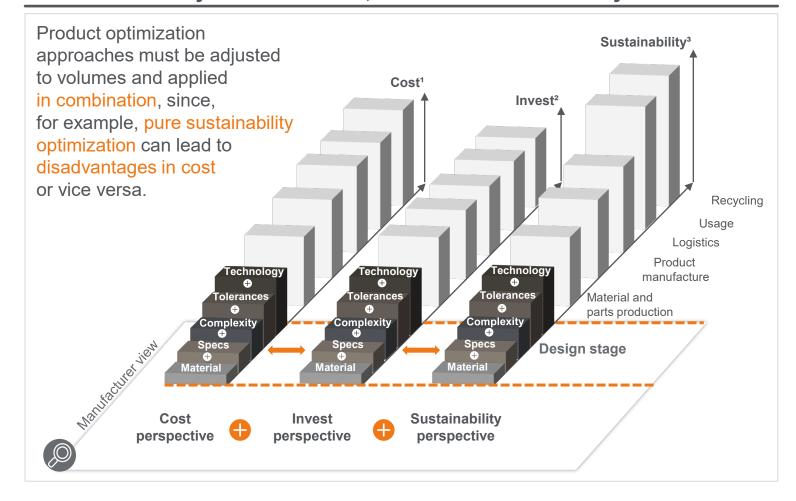
Design-for-sustainability



Optimize footprint and supply chains. Rethink value to customer by considering Circularity Framework.

Develop sustainable products!

Cumulative life-cycle view of cost, invest and sustainability



Why? Because end-to-end success of cost-out projects requires far more then just product cost calculation capabilities – this is what we provide

Results summary of our analysis



Product cost >2,000 specific processes and products

Tooling cost >620 specific benchmarks

Invest cost >1,500 unique datasets

CO₂
All product, tooling and invest data



Optimization Commercial optimization based on best-practice calculation

Value-stream optimization based on supply chain transparency

Technical optimization based on in-depth technology expertise

Integrated cost and PCF optimization based on best-practice calculation



Established solutions and databases such as TcPCM, SPHERA & Gabi, etc.

Unique solutions and databases such as EFESO I-CAT (~600 CAPEX projects, ~500 datasets and ~8,800 pcs. component cost data)

Highly innovative solutions such as Tset (Al-based software, automating cost and CO₂ calculations)



15-30%
Manufacturing process

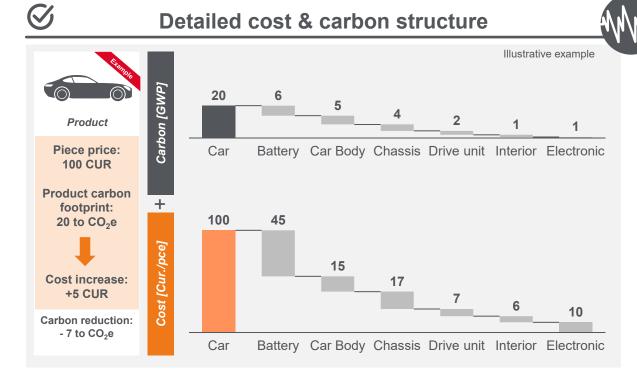
7-35% Direct materials

15-35% Tooling

25-35% Invest cost

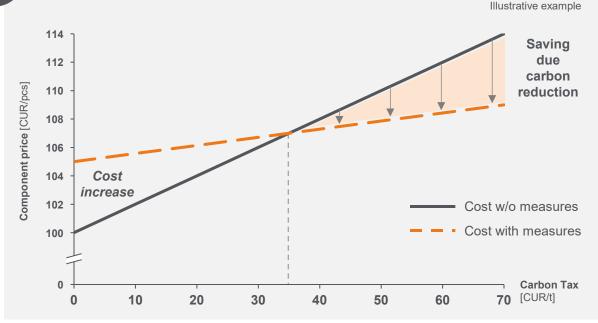


With our integrated approach, we support to objectify decisions on CO2 reduction!



Implement measures scenario





Each lever affects carbon emission and costs. The key is to find the right balance for improvements. Therefore, it is necessary to focus on a holistic analysis. Decreasing product carbon footprint, causing add-on costs, reduces the piece price after break-even.





The transparent weighting of use and benefit in a holistic view ensures the optimum cost for products.



Hyundai IONIQ 5 product tear down & cost calculation – vehicle highlights



Sustainable materials (see detail slide)



Design elements (exterior)

Distinctive shapes, including continuous joint



Powertrain

The IONIQ 5 is based on Hyundai Motor Group's 'Electric-Glob Modular Platform' (E-GMP). Supported by its long wheelbase, the IONIQ 5 offers unique proportions, an innovative interior concept combined with environmentally friendly materials, high performance paired with ultra-fast charging, a Vehicle-to-Load (V2L) function, as well as best-inclass connectivity and driver assistance features that make e-mobility even more convenient and safe





Space

Flexibility and comfort for the occupants



Front seats with reclining function std. on top line



Power length adjustment for rear seat bench std. on top line

Safety

Comprehensive safety including new systems



Head-up display with augmented reality std. on top line



Highway assist Level 2 (HAD 2) std. from plus line

EV features

Advanced EV technologies



Fast charge from 10 to 80% in 18 minutes



230V connection (V2L) under the rear seat bench



Hyundai IONIQ 5 cost calculation – assembly group overview If you have special interests in specific assembly groups, please contact us directly!

Assembly groups

02	Transmission
03	Motor cooling ZP7
04	Axle drive FA
05	Axle drive RA
07	Charging
08	Front axle
09	Rear axle
10	Wheels/tires
11	Steering
11-1	Steering column/steering shaft
12	Steering wheel
13	Foot ped/brake actuation
14	Brakes
14-1	Brake control
16	Motor/transmission bearings
19	Body structure
19-1	Body assembly parts
20	Paint and finish protection

Assembly groups

21	Bumper				
21-1	Crash Management System				
21-2	Front end				
22	Fresh air flap assy				
23	Glazing				
24	Side paneling				
24-1	Fender				
25	Wheel arch liners				
25-1	Front covers				
26	Wiper system				
27	Water catcher/drip catcher				
29	Lettering and emblems				
30	Insulation and trim				
30-1	Insulation/damping				
31	Front flap				
32	Tailgate				
33	Fuel flap/charging flap				
34	Roof system				

Assembly groups

Door

35	Door			
36	Locking system			
37	Headlights			
38	Taillights			
39	Control panel assy			
40	Center console			
41	Cockpit trays			
42	Module cross member			
43	Vent			
44	Applications			
45	Airbags			
45-1	Safety electronics			
46	Seat belts/seat belt buckles			
47	Front seats body			
47-1	Front seats platform			
48	Rear seats body			
48-1	Rear seats platform			
50	Air conditioning			

Assembly groups

50-1	Air conditioning, refrig. circuit t. drive					
51	Molded headliner/mounted parts assy					
52	Interior mirror/rear view mirror assy					
53	Pillar trim top/bottom					
54	Floor covering					
55	Hat rack/luggage compartment lid					
55-1	Rear trunk					
56	Frunk					
57	Door panel assy					
58	Interior lighting					
59	Operating and display elements					
60	Infotainment					
62	Control units					
63	Electric system					
64	Power					
65	Centralbox					
65-1	HV battery assy					
66	Driver assistance systems					



Breakdown and calculation results – detailed concept analysis and distinctive features

Assembly group axle drive front axle







Weight 84,600g



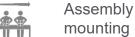
Dimensions 427 x 386 x 518mm



Material various



Manufacturing process



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Axle drive, stator, rotor, inverter, fin, EOL

Die casting, forging, injection molding,

electronics, iron casting, assembly, etc.

Concept description/details

- Supplier: Mobis
- PSM (Hairpin)
- 70kW, 255 Nm
- Axis-parlel transmission
- DCU decoupling unit
- No parking lock

- Structure hierarchy
- E-machine
- Transmission
- Inverter
- Assembly

Distinctive features

- Modular FA/RA design (identic parts)
- Busbar box as separate assembly
- Standard design axis-parlel transmission (compact function design)
- Integrated, pluggable power electronics

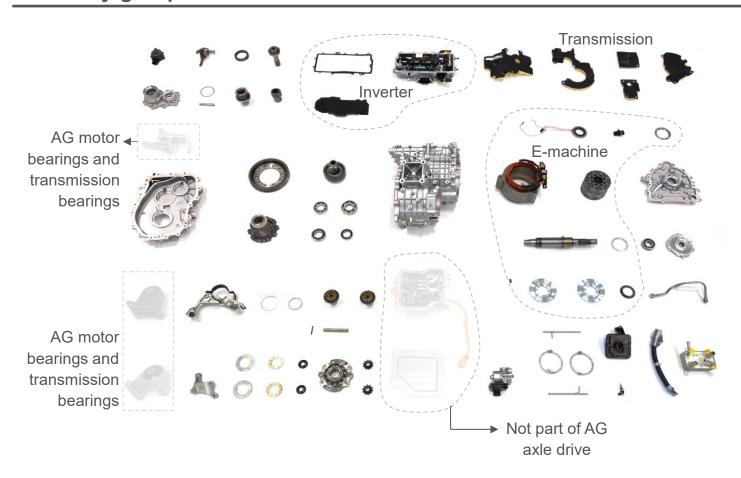
- No EMC filter
- Si power module
- Some uminum die-cast elements not blasted
- Encapsulated magnets in sheet met package
- Ceramic bearings



Source: EFESO

Breakdown and calculation results – image documentation (1/4)

Assembly group axle drive front axle



Pos	Quantity	Designation	
709	1	E-machine	
710	1	Transmission	
711	1	Inverter	



Breakdown and calculation results – image documentation (2/4)

Assembly group axle drive front axle

E-machine



Pos	Quantity	Designation
709	1	E-machine
710	1	Transmission
711	1	Inverter



Breakdown and calculation results – image documentation (3/4)

Assembly group axle drive front axle

Transmis	ssion				137		
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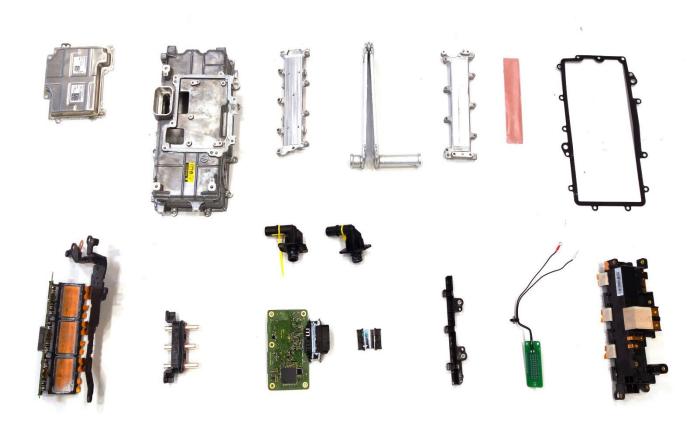
Pos	Quantity	Designation
709	1	E-machine
710	1	Transmission
711	1	Inverter



Breakdown and calculation results – image documentation (4/4)

Assembly group axle drive front axle

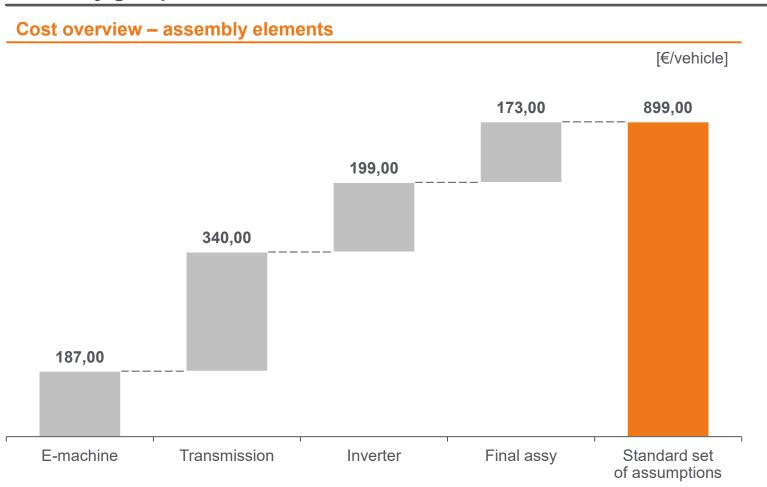
Inverter



Pos	Quantity	Designation
709	1	E-machine
710	1	Transmission
711	1	Inverter

Breakdown and calculation results – cost overview

Assembly group axle drive front axle



Explanation

- Standard set of assumptions
 - > Production site: Czech Republic medium
 - > Annual quantity: 500,000
 - Manufacturing
 - lots per year: 12
- List of assembly elements
 - > E-machine
 - Transmission
 - > Inverter

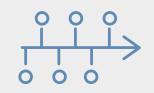
Source: EFESO

Is my company impacted – what should I do now?

1

Understand the baseline

- Are my product and investment costs competitive?
- Where are the main areas for improvement (capex, material costs...)?
- What is my product carbon footprint?



2

Identify changes and optimization measures

- What commercial 'cost down' potential do I have in the main areas (material costs, manufacturing costs, capex...)?
- Will CO₂ requirements have an impact on my cost structure?
- Do I need to change my sourcing footprint?
- How do I have to change my product, from a CO₂ perspective?



3

Strategize to balance cost, carbon, and CapEx

- Impact of carbon on your business strategy?
- Balancing C³ cost, carbon, and CapEx?
- Refine sourcing and product strategy to best adapt to a given CO₂ regulatory landscape





We wield our leading technology and process know-how, gained from >20 years of working with leading automotive players, to reduce product, invest and tools costs

EFESO provides holistic automotive market, technology, and costing insights

Thermal Entire electronics Interior Seating systems Climate systems management (ECUs) systems system Chassis units Body structure and frames Front and rear Engines & axles (driven and engine systems non-driven) LV & HV wiring **Transmissions** systems Hydraulics and Braking & Exhaust & EAT Tires & rims hydraulic Exterior systems steering systems systems cylinders

Why EFESO

- We have worked with numerous global automotive OEMs and Tier 1 suppliers etc. delivering sustainable approaches with results. Our unique track record of cost engineering & profitability competence is well known in the market
- Through our vast experience in the automotive industry, we have already broken down and analyzed all of the key technologies and supply chains used in the Automotive Industry many times over. That's why we have such deep knowledge about specific material and processing requirements





