



Success Story

## The Electric City Car e.GO Life

An RWTH Aachen Campus Development

# Participating Centers



## **ACAM Aachen Center for Additive Manufacturing | Photonics Cluster**

ACAM focuses on additive manufacturing, from construction of prototypes to game-changing additions and alternatives to industrial production. The center offers businesses a better access to the technologies and the expertise that comes with them.



## **Ramp-Up Factory | Production Engineering Cluster**

The Ramp-Up Factory focuses on the production of electric cars. Providing all required resources, the Ramp-Up Factory has created the perfect environment for developers, manufacturers and suppliers to render parts or entire vehicles ready for mass production under close-to-series conditions.



## **Demonstration Factory | Smart Logistics Cluster**

The Demonstration Factory brings together practice, research and further education. On 1,600 m<sup>2</sup>, real production offers the unique opportunity to examine questions regarding the production management of a real factory in an application-oriented way. This makes it possible to provide answers to questions encountered in daily operations, for instance how Industrie 4.0 will create a collaborative work environment.



## **European 4.0 Transformation Center | Smart Logistics Cluster**

The E4TC is a unique platform allowing companies to realize specific Industrie 4.0 cases in development, production and usage of their products. The center combines its members' expertise about all industrial core processes in the fields of industry, software and research.



## **WBA Tooling Academy Aachen | Production Engineering Cluster**

The WBA Tooling Academy Aachen is the leading partner for tool manufacturers around the world. Within the business areas of research, industry consulting and further education, the WBA addresses current problems. Moreover, in cooperation with industrial companies, the WBA develops solutions which are piloted in its own Demonstration Tool Shop.

# The Electric City Car e.GO Life

RWTH Aachen Campus with its network of science and industry enables fast and market-oriented product development and competitive manufacturing for e.GO Mobile. As a result, after a mere three years of highly iterative development, series production of the e.GO Life will begin in spring 2018 at a new factory in Aachen Rothe Erde. The State of North Rhine-Westphalia has granted partial funding for the construction of e.GO Mobile AG's production site with the help of the NRW Regional Economic Development Program (RWP).



The electric city car e.GO Life

e.GO Mobile AG developed this particularly affordable electric city car on RWTH Aachen Campus. In April 2017, the company chose Aachen for series production. The new Industrie 4.0 production site in the Aachen industrial area of Rothe Erde will be able to produce at an initial annual capacity of 10,000 cars. The city car e.GO Life will cost € 15,900 (prior to deduction of the German Federal environment incentive), at a range of around 130 km. If supplied with two additional batteries at an additional € 2,000 and 2 + 2 seating, the car will achieve a maximum range of 170 km. The first cars produced in series will be delivered in the second quarter of 2018.

## **Industrie 4.0 for Fast Development and Low Production Costs**

Professor Günther Schuh and his research team show that Industrie 4.0 makes highly iterative development processes and particularly cost-efficient production of prototypes and small-scale series possible. RWTH Aachen Campus brings together

science and business, which has allowed the development of this close-to-production car at less than 30 million euros. In cooperation with RWTH Aachen scientists, the e.GO team has been applying the Scrum process to car development. 30% of the initial prototype was made of 3D-printed components. PLM software permits both real and virtual construction and parallel development of different functional prototypes by teams in different locations. Regular, fast design checks using aixCAVE, a virtual reality installation at RWTH's IT Center, considerably accelerate the development process. Early simulations have produced an exceptionally sturdy chassis by using the strength of the battery compartment for the passive security qualities of the entire car. Structural plastic paneling reduces overall production costs particularly if produced in small quantities, compared to customary self-supporting car bodies. The 48-volt electric engines – produced on a large scale – as well as the consistent modular design further decrease the already very low production costs.

# An RWTH Aachen Campus Development

## Cooperation with the Production Engineering, Smart Logistics and Photonics Clusters

The RWTH Aachen Campus provides an environment for scientists and industry experts to engage in research on interdisciplinary issues currently encountered in the industry. Fields in which long-term research will be carried out are represented as clusters. These consist of centers, where teams of scientists from different fields and industry consortia develop visionary solutions for issues of the future. A range of different centers has been involved in the development of the e.GO Life city car.





Digitalization of products and processes



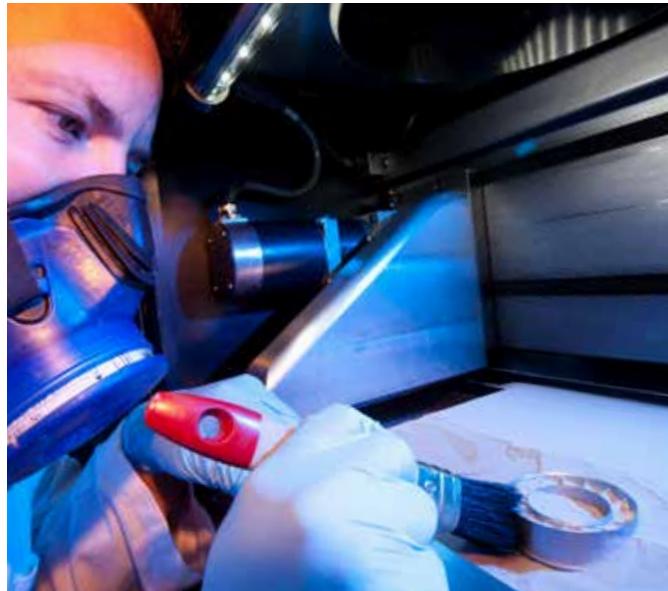
Body construction: joining technologies

### European 4.0 Transformation Center in the Smart Logistics Cluster

The European 4.0 Transformation Center (E4TC) designs and guides e.GO Mobile AG's 4.0 Transformation Program. e.GO, as a start-up, is a digitally native, agile business cooperating closely with its partners. The E4TC enrolls technology and industry businesses creating a unique platform for the digital transformation of products and processes. The resulting methods, tools and architecture enable the agile development of electric cars and agile processes in manufacturing, sales and service.

### Demonstration Factory in the Smart Logistics Cluster

The Demonstration Factory (DFA) makes it possible to experience Industrie 4.0 at work – with e.GO Mobile AG's products serving as prime examples. The DFA combines production technology practice, research and further education. This is where the car bodies of the e.GO prototypes and pre-series cars are being manufactured. The production environment at the Demonstration Factory does, however, also provide research and industry stakeholders such as the e.GO Mobile AG with a space to investigate and implement Industrie 4.0 issues in real-life operations.



Prototype realization: additive manufacturing



Product development consulting & prototype construction: metal-cutting manufacturing

### **ACAM Aachen Center for Additive Manufacturing in the Photonics Cluster**

Development of additive manufacturing, ranging from prototype construction to a real addition to industrial manufacturing, is becoming increasingly palpable. Process development to Industrie 4.0 integration, plastics to metallic high-performance materials, component design software development to realizing new machine concepts: the ACAM Aachen Center for Additive Manufacturing pools expertise individually and efficiently. In cooperation with e.GO Mobile AG, ACAM promotes additive manufacturing as a core element of agile and adaptive production. One key issue currently being investigated is the possibility of combining individual product design with additional functions. e.GO has set standards of integration in additive manufacturing – from agile car development to targeted use in series production. In this, ACAM has provided the business with its comprehensive product design and manufacturing processes expertise.

### **WBA Tooling Academy Aachen in the Production Engineering Cluster**

The WBA Tooling Academy Aachen is the key point of contact on matters pertaining to development and manufacturing of tools and prototypes. As such, the WBA works closely with e.GO Mobile AG and is crucially involved in developing the e.GO Life. Cooperation in this instance focuses on production of parts for the prototypes of the first cars as well as intensive consulting on product development. In order to improve the parts production, and thus lower costs early on and shorten delivery times, the WBA assists the e.GO Mobile AG in identifying suitable materials, designing parts according to requirements and optimizing processes. The WBA applies innovative technologies and a great range of manufacturing processes coupled with comprehensive manufacturing expertise of its staff.



Body construction: final assembly



Ramp-Up Factory: test bench

### **Ramp-Up Factory in the Production Engineering Cluster**

Supported by the Ramp-Up Factory, the RWTH Aachen Chair of Production Engineering of E-Mobility Components (PEM) has developed new options of generating and exploring holistic research and production approaches. The team develops electric-car and component production processes across six research fields – Plastic Components, Autonomous Systems, Battery Production, Electric Powertrain, Automotive Assembly and Body Shop. A number of industry partnerships complement the application-oriented research projects. Businesses can flexibly rent the “tech-shop”, an infrastructure solution including machine systems for component manufacturing. The Ramp-Up Factory allows to illustrate production processes of electric cars, focusing on the car as a whole so that full use can be made of chassis production infrastructure, an assembly line and end-of-line testing. These tools have been used to map the different

stages of the e.GO Life car development process – from initial mock-up and the final prototype – and to test the manufacturing of the cars or their individual components. The infrastructure of the Ramp-Up Factory has been funded by the EU as well as the State of North Rhine-Westphalia through the NRW Regional Economic Development Program (RWP) and Ziel2 (ERDF).





# RWTH Aachen Campus

RWTH Aachen University is one of Germany's leading technical universities. With its excellent scientists, the university provides all the expertise and experience required to tackle the challenges of megatrends. The university has recognized the importance of interdisciplinary and consortial cooperation and launched the RWTH Aachen Campus project in 2009.

## **Interdisciplinary and Consortial Research and Development**

Megatrends change the world and present all actors with big challenges. To stay competitive, the sciences, industry and society seek solutions. Individual scientific disciplines can no longer provide these on their own. This makes interdisciplinary cooperation indispensable. It can often be challenging for individual companies to finance mid-term to long-term research on their own. Cooperation within a consortium facilitates a joint financing. The RWTH Aachen Campus project promotes breaking down spatial and institutional barriers by means of strategically organized cooperation in buildings that support integration, providing a base for the consortiums. Enrolled members share resources with the university institutes, use synergies and share knowledge on site.

## **Room for Research**

Campus Melaten and Campus West have been designated for the Campus project. In 2009, the initial stage of construction to develop Campus Melaten began. The campus is home to six initial clusters: Bio-Medical Engineering, Sustainable Energy, Photonics, Production Engineering, Heavy-Duty Drives and Smart Logistics. As the second expansion stage, Campus West will be developed. The two areas will be connected to create one continuous campus integrated in public life. One of the largest research landscapes in Europe is being created on 800,000 m<sup>2</sup>.



# Contact



## Production Engineering Cluster

Prof. Günther Schuh  
 Cluster Director  
 c/o Werkzeugmaschinenlabor  
 WZL der RWTH Aachen  
 Steinbachstraße 19  
 52074 Aachen  
 Phone +49 241 80-27404  
 Fax +49 241 80-22293  
 E-mail G.Schuh@wzl.rwth-aachen.de



## Demonstration Factory Aachen

Dr. Gregor Tücks  
 Center Director  
 DFA Demonstrationsfabrik Aachen GmbH  
 Campus-Boulevard 57  
 52074 Aachen  
 Phone +49 241 51031-800  
 Fax +49 241 51031-9800  
 E-mail info@demofabrik-aachen.de  
[www.demofabrik-aachen.de](http://www.demofabrik-aachen.de)



## ACAM Aachen Center for Additive Manufacturing

Dr. Kristian Arntz  
 Center Director  
 Aachen Center  
 for Additive Manufacturing GmbH  
 Steinbachstraße 15  
 52074 Aachen  
 Phone +49 241 890686-86  
 Fax +49 241 890686-88  
 E-mail anfrage@acam-aachen.de  
[www.acam-aachen.de](http://www.acam-aachen.de)



## Ramp-Up Factory

Dr. Johannes Trieks  
 Center Director  
 c/o Production Engineering of  
 E-Mobility Components (PEM)  
 Campus-Boulevard 30  
 52074 Aachen  
 Phone +49 241 80-27427  
 Fax +49 241 80-22293  
 E-mail info@pem.rwth-aachen.de  
[www.elektromobilproduktion.de](http://www.elektromobilproduktion.de)



## European 4.0 Transformation Center

Dr. Rupert Deger  
 Center Director  
 European 4.0  
 Transformation Center GmbH  
 Campus-Boulevard 57  
 52074 Aachen  
 Phone +49 241 47574-109  
 Fax +49 241 47574-100  
 E-mail info@europeantransformationcenter.eu  
[www.europeantransformationcenter.eu](http://www.europeantransformationcenter.eu)



## WBA Tooling Academy Aachen

Dr. Wolfgang Boos  
 Center Director  
 WBA Aachener  
 Werkzeugbau Akademie GmbH  
 Campus-Boulevard 30  
 52074 Aachen  
 Phone +49 241 990163-02  
 Fax +49 241 990163-29  
 E-mail info@werkzeugbau-akademie.de  
[www.werkzeugbau-akademie.de](http://www.werkzeugbau-akademie.de)

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**RWTH Aachen Campus GmbH**

Campus-Boulevard 57  
52074 Aachen  
Phone +49 241 80-27374  
Fax +49 241 80-627374  
E-mail info-campus@rwth-aachen.de  
[www.rwth-campus.com](http://www.rwth-campus.com)