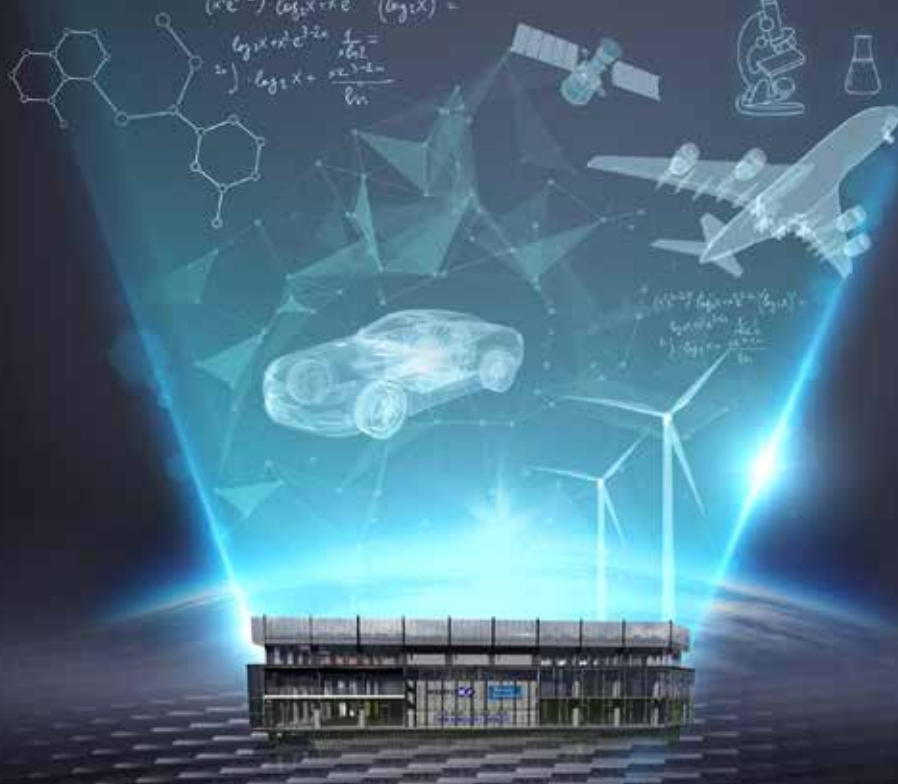




Sabancı University Integrated Manufacturing Technologies Research and Application Center

Sabancı University Integrated Manufacturing Research and Application Center (SU IMC) is an industrial-scale research and technology development center that provides laboratory testing, prototype manufacturing, design and simulation services in the scope of composite materials and additive manufacturing especially for Aerospace and Automotive Industries. It also provides consultancy and training services to governmental organizations and industrial corporations.

The center brings Sabancı University and Companies together under the same roof to create solutions for companies in areas of research, development and transformation. This unique university-industry ecosystem houses designers, engineers, production process managers, doctoral

students, postdoctoral researchers, faculty members, and incubators/entrepreneurs who play a vital role in composite technologies. Thus, SU IMC serves its partners at every stage of the product development life cycle, starting with basic research, continuing with prototyping, and ending with mass production.

SU IMC provides facilities for both basic and applied research, product development, graduate and life-long education. It acts as a center for incubation services as well as commercialization opportunities in composite manufacturing technologies and has the capacity of employing 15 faculty members, more than 90 graduate and undergraduate students, and about 40 researchers, engineers and administrative staff.

SU IMC is the First University Center in Turkey to have acquired the AS9100 Quality Management System Certificate

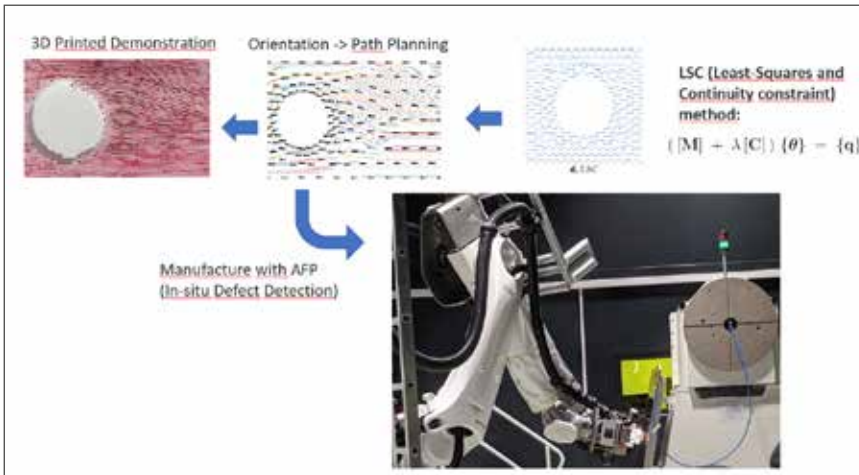
The AS9100 Certificate has critical importance in the international platform for institutions operating in the Aerospace and Defense Industry. SU IMC, which started its activities as of 2018, was audited in October 2019 and was approved by the IAQG (International Aerospace Quality Group) in March 2020 as a result of a successful audit. Built on a closed area spanning 15,000 m² with a 3,350 m² laboratory infrastructure, SU IMC became one of only six such centers worldwide, and the first

university center in Turkey with AS9100 Quality Management System certification for Aerospace organizations. SU IMC also has the TS EN ISO / IEC 17025 certificate, which is a laboratory accreditation certificate, approved in February 2019.

Research Studies

Core research areas at SU IMC are as follows;

- *Composite Design, Analysis and Manufacturing*
- *Modelling and Vibration Control of Robotic Machining Operations, Tool Dynamics, and Virtual Machining*
- *Thermomechanical Stress, and Fracture Analysis*
- *Nano and Micro Scale Composites*
- *Functional Polymers*
- *Additive Manufacturing (Metal and Polymer)*



aviation industry, Kordsa boasts a wider product range and more flexible production capabilities thanks to the strength it gains from weaving its own fabric. Kordsa's second R&D center enables it to not only to develop products but also to engage in the mass-production of preregs, fabrics, and panels for the composites industry.

In the Composite Technologies Center of Excellence, an open innovation habitat has been created and all stakeholders and universities working on composite technologies are invited to benefit from this one of a kind innovation zone.

Aerospace Projects

Currently, at SU IMC, there are 5 ongoing EU funded projects, 11 projects with Industrial Partners and 20 government-funded TUBITAK projects with a total volume of 115 MTL.

Some of the important aerospace-related R&D projects are;

- Automated Fiber Placement Method for Aerospace Applications,
- Scalable and Efficient Manufacturing of Thermoplastic Composite Aerospace Structures,
- Health Monitoring of Composite Aerospace Structures,
- Automated Repair Patch Production for Aerospace Composites,

•Design and Manufacturing for Crashworthiness and Light Weighting,

•Additive Manufacturing Novel Process Development,

•Material Development and Functional Nanomaterials,

•Characterization Methodologies of Prepreg Systems.

Composite Technologies Center of Excellence (CTCE)

Established as a result of collaboration between Kordsa and Sabancı University, the Composite Technologies Center of Excellence is focused on technology development

covering the entire value chain in the areas of composite and additive manufacturing. The Composite Technologies Center of Excellence is the first university and industry



cooperation model in Turkey and it will ensure that Turkey can make a difference with advanced technology on the global playing field and even to become a global power in this area and a player in the big league.

Kordsa, located in the same building, develops innovative and unique intermediate products and applications in composite technologies for a variety of industries. Producing thermoset preregs for the

SU IMC's support for the Battle against Covid-19

The Composite Technologies Center of Excellence has opened the entire infrastructure to the use of the Ministry of Health for the design, analysis and prototypes of the medical devices and parts used for Covid-19 treatment and personal protective

A technological center serving the complete process of innovation: idea to product



products of healthcare workers. Additionally, Sabancı Holding donated 10 tons of Antimic, a new generation disinfectant, which was developed by SU IMC academicians and provides hygiene for up to 3 months, to the Ministry of Health.

Antimic is water-based and is free of heavy metals and permanent toxic chemicals that endanger human health. It has a permanence on the surface on which it is applied provides comfortable protection with its very thin, glassy and elastic protective layer that is formed on living spaces and clothes. This cover prevents bacteria and viruses from clinging to the environment.

In addition to that, SU IMC, by using its additive manufacturing capabilities, has been supporting the production

of metal and plastic spare parts of medical devices used in the Covid-19 treatment.

A portable and easy-to-use ventilator has been designed to eliminate the troubles experienced due to the large and bulky existing respiratory devices used in intensive care units and also inadequate number. Thus, the room where the patient is located can turn into an intensive care room and the treatment is accelerated.

Although the designed device is a portable ventilator (mechanical

breathing apparatus), it also has electronic control units with respiratory support modes required for Covid-19 treatment. This enables the use of this mobile ventilator in any patient bed or ambulance with medical oxygen and air connections without the need for an intensive care bed.

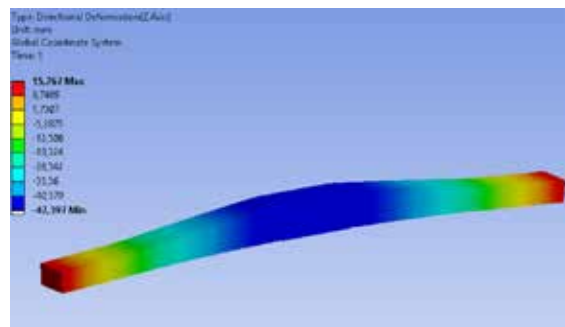
The design and technical drawings of the ventilator were completed and the material specifications were determined. In this study, Prof. Dr. Bahattin Koç and his team carry out the design, validation, prototype production and testing of the ventilator

together with ELAA Technology, a digital medical technology company



Research and Development Laboratories

In the **Computational Mechanics Laboratory**, novel modelling tools have been developed for a wide variety of problems including variable stiffness design of composite structures for metal additive modelling.





The **Advanced Composites Manufacturing Lab** aims to manufacture high quality engineered composite parts utilizing both conventional and robotic based manufacturing technologies through process modelling to explain process-robot interaction, robot motion and path planning using physical models. The lab is equipped with Robotic **Automated Fiber Placement (AFP) Machines** for thermoset and thermoplastic composite manufacturing. There are also industrial-scale **Hot Press, Robotic Machining and Abrasive Waterjet Machining** of composites and metals, and additive manufacturing of composites.

Autoclaves are essentially heated pressure vessels usually equipped with vacuum systems into which the bagged lay-up on the mould is taken for the cure cycle. It is widely used in the aerospace industry to fabricate high strength/weight ratio parts from pre-impregnated high strength fibers for aircraft, spacecraft and missiles.

In the **Mechanical Testing and Structural Health Monitoring Laboratory**, the mechanical properties of all kinds of materials are characterized and reported in accordance with international standards, accredited testing services and reports are provided, all total quality requirements are met and documented.

The **Wet Chemistry Laboratory** is equipped with several facilities for experiments ranging from the production of newly designed monomers and nanomaterials to polymer synthesis. The facilities in the lab bring innovative solutions.

The **Polymer Processing Laboratory** offers the development of thermoplastic polymer compound formulations, masterbatch preparation, and improved manufacturing processes.

The **Material Characterization Laboratory** covers the thermal, thermo-mechanical, rheological and structural characterization of all composite materials and individual components used

in composite manufacturing.

The **Additive Manufacturing Laboratory** aims to develop novel Additive Manufacturing Technologies by improving and enhancing existing processes as well as developing new hybrid processes for manufacturing multifunctional complex parts. The lab focuses on metal, high-performance plastic, composite and hybrid additive manufacturing processes, especially for the jet engine industry.

The **Flammability Testing Laboratory** offers test capabilities according to aerospace and railway industry standards which require detailed and sensitive handling and execution of flammability tests.

