SAE INTERNATIONAL

SAE EDGE™
RESEARCH REPORT

Unsettled Technology Domains in Industrial Smart Assembly Tools Supporting Industry 4.0

Thorsten Roye, Dipl.-Ing., M.Sc.

SAE EDGE™
RESEARCH REPORT

Unsettled Technology Domains in Industrial Smart Assembly Tools Supporting Industry 4.0

Thorsten Roye, Dipl.-Ing., M.Sc.
Airbus Operations GmbH

EDGE DEVELOPMENT TEAM

Lars Burkhardt, *Atlas Copco*
Baptiste Bertrand, *Airbus Operations SAS*
Pierre Deffrennes, *Desoutter Tools*
Florian Hanke, *HS-Technik*
Thomas Schönbeck, *Airbus Operations GmbH*
Sebastian Ebeling, *Siemens Gamesa*

SAE INTERNATIONAL®
Warrendale, Pennsylvania, USA

About the Publisher

SAE International® is a global association of more than 128,000 engineers and related technical experts in the aerospace, automotive, and commercial-vehicle industries. Our core competencies are life-long learning and voluntary consensus standards development. Visit sae.org

SAE EDGE™ Research Report Disclaimer

SAE EDGE Research Reports focus on topics that are dynamic, in which knowledge is incomplete, and which have yet to be standardized. They represent the collective wisdom of a group of experts and serve as a practical guide to the reader in understanding unsettled subject matter. They are not meant to provide a recommended practice or protocol. The experts have assembled as a community of practitioners to contribute and collectivize their thoughts and points of view; these are not the positions of the institutions or businesses with which they are affiliated, nor is one contributor's perspective advanced over other contributors. SAE EDGE Research Reports are the property of SAE International and SAE alone is responsible for their content.

About This Publication

SAE EDGE Research Reports provide state-of-the-art and state-of-industry examinations of the most significant topics in mobility engineering. SAE EDGE contributors are experts from research, academia, and industry who have come together to explore and define the most critical advancements, challenges, and future direction in areas such as vehicle automation, unmanned aircraft, cybersecurity, advanced propulsion, advanced manufacturing, Internet of Things, and connectivity.

Related Resources

SAE MOBILUS® Advanced Manufacturing Knowledge Hub
https://saemobilus.sae.org/advanced-manufacturing/

SAE Team

Frank Menchaca, Chief Growth Officer
Michael Thompson, Director of Standards, Information and Research Publications
Monica No[illegible]ra, Director of Content Acquisition
Beth El[illegible]n [illegible], Product Manager
William [illegible]ki, Managing Technical Editor

Printed in USA

EPR2020018
ISSN 2640-353[illegible]
e-ISSN 2640-354[illegible]
ISBN 978-1-[illegible]-02[illegible]-5

To purchase bulk quantities, please contact: SAE Customer Service

E-mail: CustomerService@sae.org
Phone: 877-606-7323 (*inside USA and Canada*)
+1-724-776-4970 (*outside USA*)
Fax: +1-724-776-0790

https://www.sae.org/publications/edge-research-reports

About the Editor

Thorsten Roye is the Manufacturing Engineering Expert for Fastening Systems at Airbus. In this role, he serves as an advisor to management and all production plants across Airbus for final and temporary fasteners, fastening tools, and fastening processes for commercial aircraft, defense and space, and helicopters.

He has a diploma in mechanical engineering–aircraft systems (Technical University in Hamburg, Germany) and a Master of Science in Composites (Private University Hannover, Germany).

Mr. Roye has worked for Airbus for the past 15 years, having been responsible for automation, robotics, and mechatronics. Currently, he leads Airbus collaboration with multifunctional teams in procurement, engineering, quality, and research and development. He represents Airbus in several workshops, training programs, and conferences worldwide.

Named on more than five issued patents, Mr. Roye is highly interested in assembly and manufacturing topics touching a broad range of industries, including automotive.

He is an assistant professor at two German universities and focuses on assembly technologies. He is also an instructor for SAE International teaching "Introduction to Airframe Engineering—Design for Manufacturing, Assembly and Automation."

contents

Atosan/Shutterstock.com

Unsettled Technology Domains in Industrial Smart Assembly Tools Supporting Industry 4.0

Abstract

This SAE EDGE Research Report identifies key unsettled definitions of the role of smart assembly tools in the Industry 4.0 world. "Smart" refers to tools that are "specific, measurable, achievable, reasonable/realistic, and time bound." Smart assembly tools are used in all industries, including automotive, aerospace, and space. These tools are employed for measuring, inspecting, gauging, drilling, and installing all existing fastening systems. The role of an assembly tool inside the Industry 4.0 environment is quite important as the smart, intelligent assembly tools have an enablement function. Smart assembly tools have a large influence on Information and Communication Technology (ICT), assembly cost reduction, process control, and even the product and process quality.

These four four domains—and their undefined nature—are the focus of this SAE EDGE Research Report. The technical issues identified here need to be discussed, the goals clarifying the scope of the industry-wide need to be aligned, and the issues requiring standardization need prioritized.

NOTE: SAE EDGE Research Reports are intended to identify and illuminate key issues in emerging, but still unsettled, technologies of interest to the mobility industry. The goal of SAE EDGE Research Reports is to stimulate discussion and work in the hope of promoting and speeding resolution of identified issues. SAE EDGE Research Reports are not intended to resolve the challenges they identify or close any topic to further scrutiny.

THORSTEN ROYE, DIPL.-ING., M.SC.
Airbus Operations GmbH

Edge Development Team

Lars Burkhardt, *Atlas Copco*
Baptiste Bertrand, *Airbus Operations SAS*
Pierre Deffrennes, *Desoutter Tools*
Florian Hanke, *HS-Technik*
Thomas Schönbeck, *Airbus Operations GmbH*
Sebastian Ebeling, *Siemens Gamesa*

ISSN 2640-3536