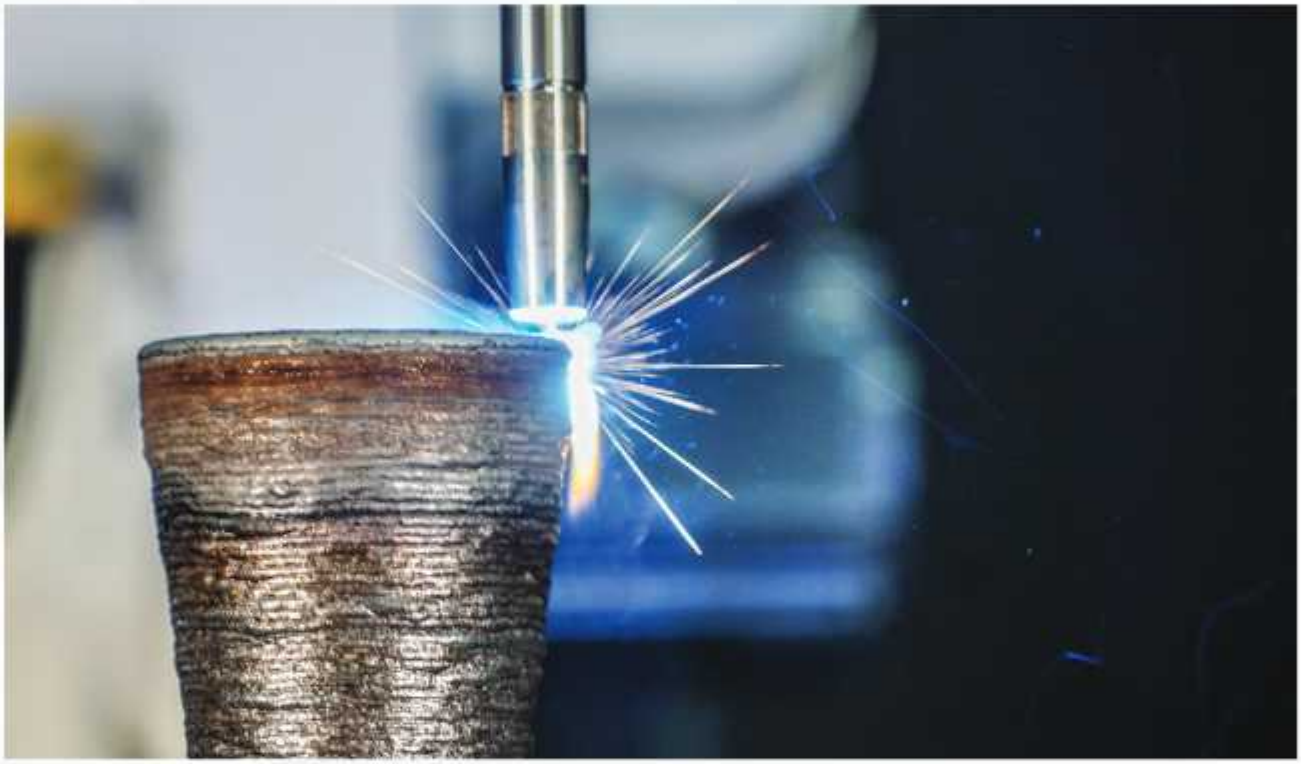
WAM 2023

International Hybrid Conference

ADVANCES IN WELDING and METAL ADDITIVE MANUFACTURING TECHNOLOGIES

On the occasion of 100th Anniversary of Turkish Republic

30-31 October 2023
İstanbul, Türkiye



FINAL PROGRAM

FOR ORAL and ON-LINE PRESENTATIONS

İstanbul GEDİK University
Gedik Vocational School Conference Hall
Pendik/Istanbul

For Registration

İstanbul GEDİK University

Supported by

Gedik Welding

大阪大学 OSAKA UNIVERSITY

PREFACE

WAM-2023 is organised in Istanbul at 30-31 October 2023 on the 100th Anniversary of Turkish Republic to provide scientific platform to present and discuss latest developments in welding and metal additive manufacturing (AM) technologies word-wide. It is a unique conference by combining both welding and AM Technologies since metal AM, particularly Wire Arc Additive Manufacturing (WAAM), very much developing on the fundamentals of robotic arc welding and their recent developments. Hence, experts of both research areas need to be meeting and discussing their latest results. The **WAM-2023** is designed for this very purpose and will continue as a two-day hybrid event in the month of October every year. The selected papers from presented works will be reviewed and published as a WAM-2023 Special Issue in the *Welding in the World (WiW)* which is an official journal of the IIW.

WAM-2023 is organised by İstanbul Gedik University where numbers of research projects on the welding and additive manufacturing have been conducted in cooperation with the 60-years-old Gedik Welding industry. WAM 2023 Conference has received valuable supports of the IIW, EWF, TKTA, OTC Daihen Japan, Gedik Welding, Osaka University Japan, Osmania University India, T-HUB India to develop an international platform of experts for the successful exchange of information on welding and AM Technologies.

WAM-2023 is organised as hybrid conference by having both oral and online presentations allowing oversea participations with long time differences with local time in Istanbul. Therefore, both days are inevitably long to accommodate this time differences and hence we thank for the patience and high concentration of the participants to the valuable presentations of the authors.

WAM-2023 conference is covering numbers of new and innovative studies both in welding and AM technologies, such as; Laser beam hybrid submerged arc welding, Developments in friction stir welding and FSW of Al-alloy 6063, Pipe welding and properties of HFW process, Laser beam welding, Gas tungsten arc welding, Dissimilar joints of Al-steel and their interface analyses.

PREFACE

With respect to Additive Manufacturing and WAAM Technologies, recent results from domestic and international studies are presented by covering various materials such as; Ni-based super Al-alloys, Stainless steels, Shape memory alloys. Furthermore, in-situ flaw detection and NDT aspects of the AM&WAAM parts of both wire and powder based processes are covered. The results of the studies regarding numerical analysis and Laser powder bed fusion processes together with the data based quality analysis of WAAM parts are presented. The studies on the Robotic WAAM and the use of Artificial Intelligence approach for the DED arc process have shared their recent results.

Finally, international AM qualification system for personnel is presented by the EWF expert to demonstrate the importance, needs and the organizational procedures of the skilled personnel for the emerging AM Technologies.

I would like to express my sincere gratitude to Ms. Hülya Gedik, Chair of the Board of Directors of Gedik Holding and Chair of the Board of the Trustees of İstanbul Gedik University and Prof. Dr. Ahmet Kesik, Rector of the İstanbul Gedik University for their and valuable supports for the conference.

I would like to extend my sincere thanks to Dr. Uğur Gürol and his team; Ms. Sedef Çakır Ayçiçek, Ms. Yeşim Yücel, Mr. Batuhan Turgut, Ms. Hülya Kumek, Mr. Abdülhamit Uyanık, Ms. Ceren Çelik for their tiredless eorts during the preparation of the conference. Furthermore, my thanks surely goes to the academic and technical sta members of the İstanbul Gedik University and Gedik Holding for their valuable supports.

See you at the WAM 2024, October 2024 İstanbul.

Prof. Dr. Mustafa Koçak, Chair WAM 2023

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Ceren ÇELİK MSc.

LIST OF PRESENTATIONS

30 October 2023

08^{00} - 08^{30} Registration of Participants

Opening Session

08^{30} - 09^{00} Hülya Gedik, Chair of the Board of the Trustees, Istanbul Gedik University
Prof. Dr. Ahmet Kesik, Rector of Istanbul Gedik University
Prof. Dr. Mustafa Koçak, Chair WAM 2023 International Conference

Additive Manufacturing Session-1
Chair: Prof. Dr. Mustafa KOÇAK, Istanbul Gedik University, TÜRKİYE

09^{00} - 09^{20} Invited Speaker: Ana Beatriz LOPEZ
International Additive Manufacturing Qualification System for Personnel
A B Lopez, A Almeida, R Bola
European Federation for Welding (EWF), BELGIUM

09^{20} - 09^{40} Invited Speaker: C. Hakan GÜR
Recent Developments in Non-Destructive Evaluation of Additively Manufactured Metallic Components
C H Gür
Middle East Technical University (METU), TÜRKİYE

09^{40} - 10^{00} Invited Speaker: Sriram VENKATESH
Additive Manufacturing: Prototype to Product - *Online*
S Venkatesh
Osmania University, INDIA

10^{00} - 10^{20} Invited Speaker: Oğuzhan YILMAZ
Current Research Activities and Industrial Applications of Metal Additive Manufacturing Technologies in Turkey
O Yılmaz
Gazi University, TÜRKİYE

10^{20} - 10^{40} **PRESENT and FUTURE of the IIW** - *Online*
T Bollinghaus
IIW President, BAM Berlin, GERMANY

10^{40} - 11^{00} **COFFEE BREAK**

Welding Session-2
Chair: Prof. Dr. Emel TABAN, Kocaeli University, TÜRKİYE

11^{00} - 11^{20} Invited Speaker: Tomoyuki UEYAMA
An Overview of the State-of-the-Art Development of Welding and Joining Technology
T Ueyama
OTC Daihen, JAPAN

11^{20} - 11^{40} Invited Speaker: Ali Gökhan DEMİR
New Developments on the Laser Beam Welding Technology: Challenges and Opportunities
A G Demir
Politecnico di Milano, ITALY

11^{40} - 12^{00} **High-Power Laser Hybrid Welding of Structural Steels – Potential Application in Wind Tower Fabrication**
C Brunner-Schwer, N Bakir, F Akyel, Ö Üstündag, A Gumenyuk, M Rethmeier
BAM Berlin, GERMANY

12^{00} - 12^{20} **Influence of Heat Input on Cooling Rates and Mechanical Properties of Laser Hybrid Welded Thick Structural Steels**
Ö Üstündağ, N Bakir, A Gumenyuk, M Rethmeier
BAM Berlin, GERMANY

12^{20} - 14^{00} **LUNCH BREAK**

Additive Manufacturing Session-3
Chair: Prof. Dr. Oğuzhan YILMAZ, Gazi University, TÜRKİYE

14^{00} - 14^{20} **Investigation on Plasma Characteristic and Melt Behaviour in Wire-Arc Additive Manufacturing of Titanium Alloy**
D Wu, H Komen, X Xiao, M Tanaka
Osaka University, JWRI, JAPAN

14^{20} - 14^{40} **Review on Mechanical Testing and Defect Assessment of Additive Manufactured Metallic Materials**
M Koçak, U Gürol, B Turgut, H Kumek, S Çakır Ayçiçek, S Dilibal
Istanbul Gedik University, TÜRKİYE
B Yalçıner
NPCC, ABU DHABI

14^{40} - 15^{00} **Improvement in Corrosion Performance of Additive Manufactured Stainless Steel and Ni-Based Superalloy in NaCl Solution**
A Günen, U Gürol, M Koçak, G Çam
Iskenderun Technical University, TÜRKİYE
Istanbul Gedik University, TÜRKİYE

15^{00} - 15^{20} **Investigation of Temperature and Stress Distributions After A Simple Wire Arc Additive Manufacturing Process**
A Savaş
Piri Reis University, TÜRKİYE

15^{20} - 15^{40} **Ni-Based Superalloy 718 Fabricated Via Arc Plasma Directed Energy Deposition: Post-Deposition Heat Treatments Development** - *Online*
F W C Farias, T G Santos, J P Oliveira
NOVA School of Science and Technology, PORTUGAL
Associated Laboratory of Intelligent Systems, PORTUGAL

15^{40} - 16^{00} **COFFEE BREAK**

Welding and Additive Manufacturing Session-4
Chair: Assoc. Prof. Dr. Savaş DİLİBAL, Istanbul Gedik University, TÜRKİYE

16^{00} - 16^{20} Invited Speaker: Emel TABAN
Joining Dissimilar Materials: Understanding Aluminum to Steel Interfaces During Joining and Beyond
E Taban
Kocaeli University, TÜRKİYE

16^{20} - 16^{40} Invited Speaker: Gürel ÇAM
The Current Progress in the Application of Friction Stir Welding in Transportation Industries
G Çam
Iskenderun Technical University, TÜRKİYE

16^{40} - 17^{00} **Investigation of Laser Welding Bridgability on Aluminum Sheets and Its Effect on Mechanical Properties**
O Tekelioğlu
Istanbul Technical University (ITU), TÜRKİYE

17^{00} - 17^{20} Invited Speaker: Nick BAGSHAW
Reactive Additive Manufacturing Wire Feedstock and Process Control for 3D Printing of Large-Scale Structures with Complex Geometry - *Online*
N Bagshaw
Fortius Metals, USA

17^{20} - 17^{40} **Suitability of Iron-Based Shape Memory Alloy for Arc-Based DED Additive Manufacturing** - *Online*
I O Felice, J Shen, B Li, B Wang, N Schell, E Ghafoori, T G Santos, J P Oliveira
NOVA School of Science and Technology, PORTUGAL
Western Superconducting Technologies Co., Ltd, CHINA
Harbin Institute of Technology, CHINA
Helmholtz-Zentrum Hereon, GERMANY
Leibniz University of Hannover, GERMANY
Associated Laboratory of Intelligent Systems, PORTUGAL

17^{40} - 18^{00} **Additive Manufacturing Based on Pulsed GMAW with Stainless Steel 308L - A Method for Parameter Definition and Characterization of Metallic Transfer Modes** - *Online*
T J B Ribeiro, F G F Coelho, A R Arias, R R Ferreira
Federal University of Minas Gerais, BRAZIL

18^{00} - 18^{20} **Evaluation of the Properties of Inconel 625® Preforms Manufactured using the WAAM Process** - *Online*
W F da Silva, G M M Junior, H C P de Oliveira, J C de A Pires, J R G Carneiro
Federation of Industries of the State of Minas, BRAZIL
Pontifical Catholic University of Minas Gerais, BRAZIL

18^{20} - 18^{40} **Gas Tungsten Arc Welding of As-Cast AlCoCrFeNi$_{2.1}$ Eutectic High Entropy Alloy** - *Online*
J Shen, J G Lopes, J P Oliveira
NOVA School of Science and Technology, PORTUGAL

31 October 2023

09^{00} - 09^{10} Prof. Dr. Mustafa Koçak
Opening and Welcome DAY II

Additive Manufacturing Session-5
Chair: Asst. Prof. Dr. Uğur GÜROL, Istanbul Gedik University, TÜRKİYE

09^{00} – 09^{20} Invited Speaker: Gürel ÇAM
Manufacturing of Aluminium Parts by Welding and Additive Manufacturing (AM): Challenges and Prospects
G Çam
Iskenderun Technical University, TÜRKİYE

09^{20} – 09^{40} **Synchrotron Tomography Conducted in Additive Manufactured Components with Integrated Multi-Functionalities**
A B Lopez, R Bola, K Bugelnig
European Federation for Welding (EWF), PORTUGAL

09^{40} – 10^{00} **Three-Dimensional Particle Simulation of Molten Metal Flow in Wire Arc Additive Manufacturing Process Using Rotary Torch** - *Online*
H Komen, M Tanaka, S Kanemaru, S Nomoto, K Wada, T Sasaki, E Tabata
Osaka University, JAPAN

10^{00} – 10^{20} Invited Speaker: Shahram SHEIKHI
Data Based Analysis of the Quality of WAAM Products - *Online*
S Sheikhi, S Alaparthi, S P Subadra
Hamburg Technology University, GERMANY

10^{20} – 10^{40} **Flaw Detection in Wire and Arc Additive Manufacturing using In-Situ Wide Frequency Bandwidth Acoustic Pressure** - *Online*
A Ramalho, T G Santos, B Bevans, Z Smoqi, P Rao, J P Oliveira
NOVA School of Science and Technology, PORTUGAL

10^{40} - 11^{00} **COFFEE BREAK**

Welding Session-6
Chair: Prof. Dr. Gürel ÇAM, Iskenderun Technical University, TÜRKİYE

11^{00} – 11^{20} Invited Speaker: Simon OLSCHOK
Laser Beam Submerged Arc Hybrid Welding – Overview and New Research Results on A High-Performance Welding Process - *Online*
S Olschok, M Clemens, U Reisgen
RWTH Aachen University, GERMANY

11^{20} – 11^{40} **Investigation of Weldability of AA6063 Aluminum Alloy by Friction Stir Welding Method**
M Hıdıroğlu, T A Başer, O Tekelioğlu, G Tarakçı, G Özer, E Koç
Coşkunöz CKM R&D Center, TÜRKİYE
Fatih Sultan Mehmet Vakif University, TÜRKİYE

11^{40} – 12^{00} **Heat Treatment in High-Frequency Welding (HFW) Pipe Manufacturing, Investigation of the Effect on the Welding Region**
M Biçen
ÜMRAN PIPE, TÜRKİYE

12^{00} – 12^{20} **Investigation of Material Mechanical Strength Variation in Steel Pipe Manufacturing**
M Biçen
ÜMRAN PIPE, TÜRKİYE

12^{20} - 14^{00} **LUNCH BREAK**

Additive Manufacturing Session-7
Chair: Assoc. Prof. Dr. Binnur SAĞBAŞ, Yıldız Technical University, TÜRKİYE

14^{00} - 14^{20} **A Numerical Investigation of Powder Spreading in Powder Bed Based Additive Manufacturing Processes**
M F Çoşkun, R Önler
Gebze Technical University, TÜRKİYE

14^{20} - 14^{40} **Repair Solutions for Damaged Parts by Additive Manufacturing in Bulgaria** - *Online*
S Boshnakova
Bulgarian Welding Society, BULGARIA

14^{40} - 15^{00} **Mechanical and Microstructural Properties of Stainless-Steel Wires in Robotic WAAM Parts**
U Gürol, B Turgut, H Kumek, S Çakır Ayçiçek, M Koçak
Istanbul Gedik University, TÜRKİYE

15^{00} - 15^{20} **Recent Developments and Challenges in Metal Additive Manufacturing**
M Korgancı, Y Bozkurt
Marmara University, TÜRKİYE

15^{20} - 15^{40} **Wire Arc Additive Manufacturing of Aluminium Alloys: A Review on Processes, Materials and Their Behaviour**
A A Çelik, E Ferik, Y Bozkurt
Marmara University, TÜRKİYE

15^{40} - 16^{00} **COFFEE BREAK**

Welding and Additive Manufacturing Session-8
Chair: Dr. Ana Beatriz LOPEZ, EWF, PORTUGAL

16^{00} - 16^{20} **Determination of the Optimum Path Plan in Panels Strengthened with the Directed Energy Deposition Method using Artificial Intelligence**
B Aydoğdu, N Kaya
Bursa Uludağ University, TÜRKİYE

16^{20} - 16^{40} **High Hardness Ta Doped Eutectic High Entropy Alloy by Wire Arc Additive Manufacturing** - *Online*
A Zavdoveev, I Klochkov, S Motrunich, A Klapatyuk
Paton electric welding institute, UKRAINE

16^{40} - 17^{00} **Impact of Gas Tungsten Arc Welding on the Microstructure and Mechanical Performance of A $Fe_{50}Mn_{30}Co_{10}Cr_{10}$ High Entropy Alloy** - *Online*
J G Lopes, J Shen, P Agrawal, N Schel, R S Mishra, J P Oliveira
NOVA School of Science and Technology, PORTUGAL

17^{00} - 17^{20} **Processing Parameters Evaluation of A Metastable High Entropy Alloy Fabricated by Laser Powder Bed Fusion** - *Online*
I A de B Moura, J P Oliveira
University of North Texas, USA
NOVA School of Science and Technology, PORTUGAL

17^{20} - 17^{40} **Thermal and Microstructural Analysis of Intersections Manufactured by Wire Arc Additive Manufacturing (WAAM)** - *Online*
B M Sousa, F G F Coelho, G Ma M Júnior, H C P de Oliveira, N N da Silva
Federal University of Minas Gerais, BRAZIL
National Industrial Learning Service (SENAI), BRAZIL

17^{40} - 18^{00} **COFFEE BREAK**

Welding and Additive Manufacturing Session-9
Chair: Prof. Dr. Mustafa KOÇAK, Istanbul Gedik University, TÜRKİYE

18^{00} - 18^{20} **Investigation on Mechanical and Microstructural Characterization of Microplasma Arc Welding of Thin 316L Stainless Steel Sheets** - *Online*
Ü Şentürk, A Adsoy, E Çakır, A Topuz
Istanbul Arel University, TÜRKİYE
AYVAZ A.Ş., TÜRKİYE

18^{20} - 18^{40} **Effect of Heat Input on Microstructure and Microhardness of Robotic MIG Fillet Welded Armour Steel for Ferritic Filler Usage**
M Göçmen, O Çoban, U Gürol, M Koçak
Istanbul Gedik University, TÜRKİYE

18^{40} - 19^{00} **Effect of Welding Current on Joining of AISI 316L Steel by TIG Welding Process**
V Şimşek, P Topuz
Evyap Sabun Yağ Gliserin San. ve Tic. A.Ş. TÜRKİYE
Istanbul Gedik University, TÜRKİYE

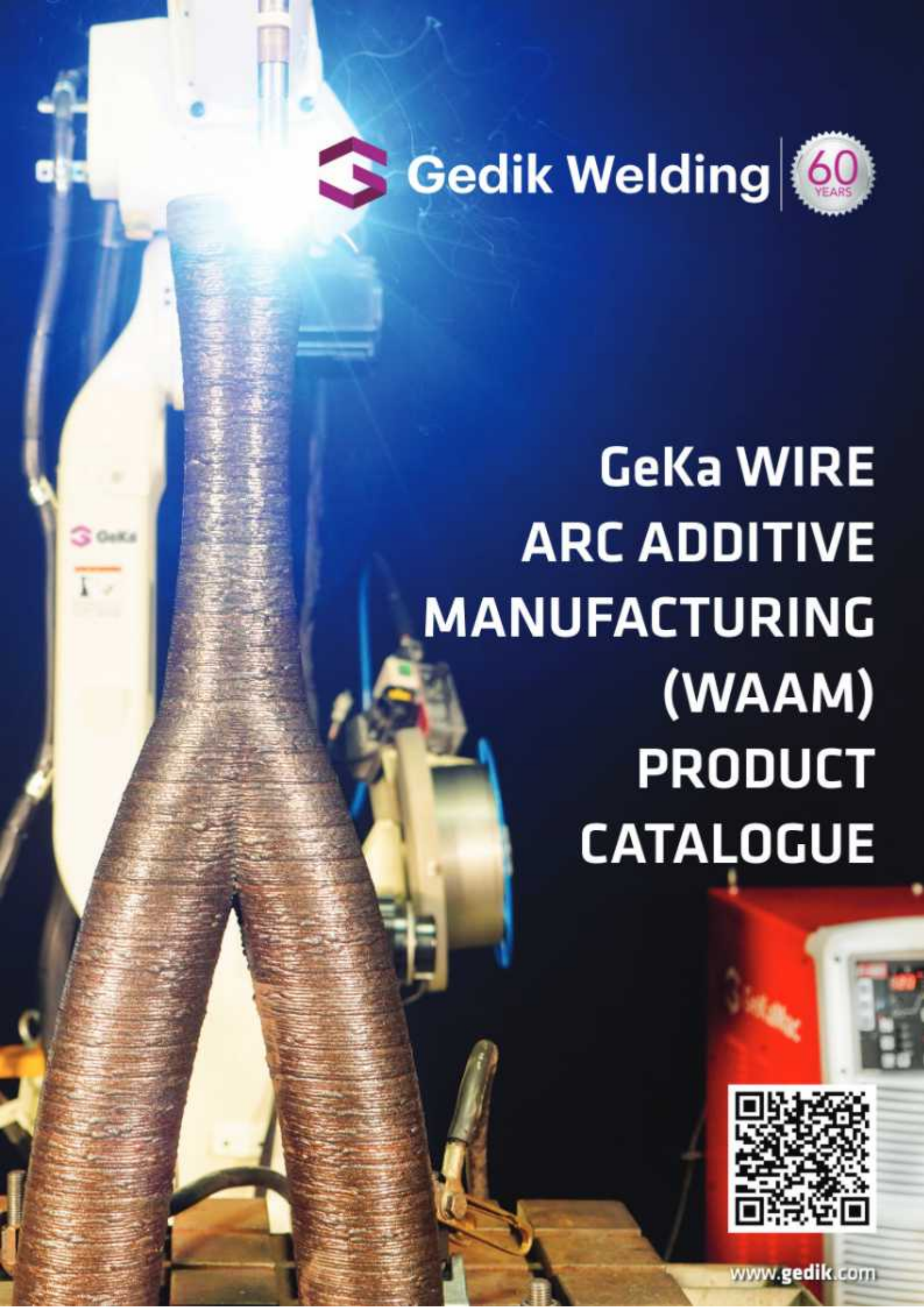
19^{00} - 19^{20} **A Comparison Between Dissimilar MIG Welding of Selective Laser Melted AlSi10Mg Plates**
M Hıdıroğlu, E Yiğitoğlu, N Kahraman
Coşkunöz CKM R&D Center, TÜRKİYE
Karabuk University, TÜRKİYE

19^{20} - 19^{40} **Effect of A Friction Stir Welding Tool on the Mechanical Properties of A Welded Joint Produced by Additive Manufacturing**
E Tabanlıoğlu, M Hıdıroğlu, O Akyel, Ni Kahraman
Coşkunöz Kalıp Makina Sanayi ve Ticaret Anonim Şirketi, TÜRKİYE
Karabuk University, TÜRKİYE

19^{40} - 20^{00} **Gas Metal Arc Welded Dissimilar AISI 430/AISI 304L Butt Joint: Microstructure and Joint Performance**
H T Serindağ, G Çam
Iskenderun Technical University, TÜRKİYE

Prof. Dr. Mustafa KOÇAK
Closing Remarks of the Conference WAM 2023
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