



INTERNATIONAL INSTITUTE OF WELDING

A world of joining experience

Doc. I-1586-2024

Annual Assembly Dodecanisa, Rhodes, Greece 2024

Venue: Rodos Palace Hotel, Trianton Avenue, Ixia 85100

Final Agenda, Revision 2

C-I: Additive Manufacturing, Thermal Cutting and Thermal Spray

July 8 - 10, 2024

Room: Listed by day of meeting

Chair: Doug Kautz (USA)

Monday 8 July 2024, 1430 – 1830 @ Nafsika A

1. Opening of the Meeting
2. Request Meeting Secretary to write the Minutes of Meeting
3. Attendees and Apologies, Identification of C-I delegates
4. Approval of the minutes from the last annual assembly in Bali (Doc. I-1587-2024)
5. Adoption and Agreement of Agenda (Doc. I-1586-2024)
6. Discussion of Joint Intermediate Meeting in Cambridge, UK
7. Presentation of documents:

1445: Session 1: C-I Papers (20 minutes per paper incl. questions) Session Chair: Doug Kautz

- [01] 1445: Influence of In-Process Ultrasonic Vibration on Grain Refinement of a 316L Stainless Steel in Wire Arc Additive Manufacturing
Antoine Queguineur, Olli Wiikinkoski, Gaurav Mohanty, Jean-Yves Hascoët, Iñigo Flores Ituarte (Finland/France)
Doc. I-1588-2024
- [02] 1505: Temperature-dependent tensile deformation and plasticity loss mechanism of a novel Ni-Cr-W-based superalloy prepared by laser powder bed fusion
Xinxin Liu (China)
Doc. I-1589-2024
- [03] 1525: Dot-by-Dot Wire-Arc Additive Manufacturing of Load-Bearing Rods
Yiğit Hergül, Murat Yücel, Gökhan Can, Ulaş Yaman (Turkey)
Doc. I-1590-2024
- [04] 1545: Design of Experiments Approach in Wire-Arc Additive Manufacturing: Optimization in Pressure Tank Production
Tansu Göynük, Gökhan Can, Yiğit Hergül, Murat Yücel, Ulaş Yaman (Turkey)
Doc. I-1591-2024

1615-1645: Coffee break

- [05] 1645: Controlling Bead Shape in Wire Arc Additive Manufacturing via Direct Roll Forming of Molten Metal Pool
Hwi Jun Son, Seok Kim, and Young Tae Cho (South Korea)
Doc. I-1592-2024
- [06] 1705: Additive Manufacturing of Novel CoCrMoFe Alloy for Dental and Maxillofacial Applications
Jag Parvesh Dahiya and Murugaiyan Amirthalingam (India)
Doc. I-1594-2024
- [07] 1725: Wire-arc direct energy deposition of WE43 magnesium alloy: microstructure evolution and high temperature performance
Fukang Chen, Xiaoyu Cai, Bolun Dong, Sanbao Lin (China)
Doc. I-1595-2024
- [08] 1745: A Study on Plasma Cutting Machine's Nozzle Degradation Detection Method Based on Cutting Noise Analysis
Tomoya Yamauchi, Takayuki Yotsuzuka, Takaaki Takeuchi, Naoki Osawa (Japan)
Doc. I-1596-2024
- [09] 1805: Discussion on WitW Papers

Close of Day 1 Activities

Tuesday 9 July 2024, 0855 -1830 @ Delphoi Joint Meeting of C-I, C-IV, and C-XII

Morning Session, 0855-1300 Session 1: Chair: Professor Satoru Asai

0855: Opening of Joint Meeting of C-I, C-IV, and C-XII – Professor Satoru Asai

- [10] 0855: 3D Printing and Surfacing of Inconel 625 through Automated Wire Arc Additive Manufacturing
Constantinos Goulas, Marcel J. M. Hermans, Aditya Rajes, Remco Rook, Baikhati Elok Satiti, Harry Thompson, Wei Ya (Netherlands)
Doc. XII-2706-2024/I-1616-2024/IV-1647-2024
- [11] 0915: A heat source for milli – scale WAAM technology
Saki Shigematsu, Hisaya Komen, Manabu Tanaka, Tadasuke Murata, Akihisa Murata (Japan)
Doc. XII-2696-2024/I-1617-2024/IV-1648-2024
- [12] 0935: Mitigation of ductility dip cracking in Invar 36 alloy during wire arc additive manufacturing through enhanced cooling and in-situ alloying of TiC particles
Constantinos Goulas, Marcel Herman, Vera Popovich, Arjun Sood (Netherlands)
Doc. XII- 2687-2024 /I-1618-2024/IV-1649-2024
- [13] 0955: Forming regulation in additive manufacturing based on a novel model: In-order stacking of primitives
Shujun Chen, Jun Xiao, Zhaoyang Yan (China)
Doc. XII- 2685-2024 /I-1619-2024/IV-1650-2024
- [14] 1015: Feasibility study on machine learning methods for the prediction of process parameters for the WAAM process using SS-316L filler material
Arash Hasan Reize , Peethambaran Subadra Sharath, Shahram Sheikhi (Germany)
Doc. XII- 2682-2024 /I-1620-2024/IV-1651-2024
- [15] 1035: Presentation by IIW Staff
Elisabetta Sciacaluga (IIW)

Coffee Break (1045– 1115)**Session 2: Chair: Professor Satoru Asai**

- [16] 1115: Combination of the melt pool geometry parameters with the audio data for defect detection in GMAW and WAAM
Dmytro Havrylov (Canada)
Doc. XII-X 2684-2024 /I-1621-2024/IV-1652-2024
- [17] 1135: Influence of edge surface quality on Hybrid Laser Arc Welding of structural steel S355J2
Martin Petreski, Dobre Runchev, Gligorche Vrtanoski, Aleksandra Krstevska (North Macedonia)
Doc. XII- 2668-2024 /I-1622-2024/IV-1653-2024
- [18] 1155: Application of Tailor Welded Blanks to Rudder Frame Using Laser-Arc Hybrid Welding
Tetsuo Era, Kento Takeda, Tetsuji Egawa, Keiichi Kashiwabara, Masahide Tatsutomi, Hiroshi Uchiyama (Japan)
Doc. XII- 2689-2024 /I-1623-2024/IV-1654-2024
- [19] 1215: Investigating the effect of shielding gas on arc plasma behaviors and welded quality in GMAW-GTAW hybrid welding process on AA5083 aluminium alloy
Titinan Methong, Ratchadaporn Boonrungsee, Benchaphorn Chanprasertkul (Thailand)
Doc. XII- 2666-2024 /I-1624-2024/IV-1655-2024
- [20] 1235: Effect of current waveform in MIG arc on weld bead formation in plasma-MIG hybrid welding
Shinichi Tashiro, Kazuya Ishida, Kazufumi Nomura, Dongsheng Wu, Anthony B Murphy, Toshifumi Yuji, Manabu Tanaka (Japan)
Doc. XII- 2701-2024 /I-1625-2024/IV-1656-2024

Afternoon Session, 1425-1830**Session 3: Chair: Dr. Patrick Hochanadel**

1425: Opening of Afternoon Session of C-I, C-IV, and C-XII – Dr. Patrick Hochanadel

- [21] 1425: Effect of Welding Speed on Keyhole Behavior and Spatter Formation in Full Penetration Laser Beam Welding using High-Speed Synchrotron X-Ray Imaging
C. Diegel, K. Schrickler, L. Schmidt, M. Seibold, H. Friedmann, P. Hellwig, F. Fröhlich, J.P. Bergmann, F. Nagel, P. Kallage, A. Rack, H. Requardt, and Y. Chen (Germany)
Doc. XII-2711-2024/I-1626-2024/IV-1619-2024
- [22] 1445: Online Monitoring of Penetration Depth during Hybrid Laser/GMA Welding of Stainless Steels by an Inline Coherent Imaging Sensor
F. Kong and M. Yao (United States)
Doc. XII-2712-2024/I-1627-2024/IV-1620-2024
- [23] 1505: Laser Beam Submerged Arc Hybrid Welding of Thick High-Strength Pipeline Steels
M. Clemens, S. Olschok, and U. Reisgen (Germany)
Doc. XII-2713-2024/I-1628-2024/IV-1621-2024
- [24] 1525: Challenges in Modelling Dynamic Heat Sources in High-Power Laser Beam Welding
M. Bachmann, W. Meng, A. Artinov, and M. Rethmeier (Germany)
Doc. XII-2714-2024/I-1629-2024/IV-1622-2024
- [25] 1545: Investigation on the Microstructure and Mechanical Properties of Dissimilar Joint of PBF-LB/M/IN718 to AISI 316L by Laser Welding
S. Parchegani, H. Piili, M. Amraei, S. Afkhami, and A. Salminen (Finland)
Doc. XII-2715-2024/I-1630-2024/IV-1608-2024

Coffee Break (1615 – 1645)**Session 4: Chair: Dr. Patrick Hochanadel**

- [26] 1645: Welding of Laser Powder Bed Fusion Manufactured Haynes 282 alloy: Microstructure and Mechanical Properties
J. Kunnackath Krishnan, M. Arunkumar, and G. Phanikumar (India)
Doc. XII-2716-2024/I-1631-2024/IV-1623-2024
- [27] 1705: Effect of Local Gas Supply on Keyhole Dynamics in Laser Beam Welding of High-Alloy Steel AISI 304 by means of High-Speed Synchrotron X-Ray Imaging
L. Schmidt, K. Schricker, C. Diegel, H. Requardt, Y. Chen, A. Rack, and J.P. Bergmann (Germany)
Doc. XII-2717-2024/I-1632-2024/IV-1624-2024
- [28] 1725: Laser Welding with Superimposed Beam Oscillation in the Direction of Propagation
M. Pieper (Germany)
Doc. XII-2718-2024/I-1633-2024/IV-1625-2024
- [29] 1745: A New Additive Manufacturing Technique by Laser Melting of Sheets Binding Metal Powder
A.F.H. Kaplan, P. Guo, J. Volpp, H. Naesstroem, R. Lupoi, R. Casati, S. Marola (Sweden)
Doc. XII-2719-2024/I-1634-2024/IV-1626-2024
- [30] 1805: The Study on the Prediction Model of Weld Depth during Fiber Laser Deep Penetration Welding based on Primary Absorption of the Front Keyhole Wall
B. Zhu, J. Zou, R. Xiao, T. Huang (China)
Doc. XII-2720-2024/I-1635-2024/IV-1627-2024

1825: Close Out of First Day Joint Meeting of C-I, C-IV, and C-XII – P. Hochanadel

Wednesday 10 July 2024, 1430 - 1830 @ Nafsika A **Commission I Meeting, continued from Monday**

1430: Session 2: C-I Papers (20 minutes per paper including questions)

1430: Open and Welcome – D. Kautz

Continuation of Commission I Administrative Tasks:

8. Structure of Commission I: Election of Subcommittee Chair
9. Activities of Commission I
10. List of Documents (Doc. I-1577-24)
11. Joint Workshops/Meetings with Other IIW Units
12. Resolutions by Commission I from 2024 Meeting
13. Other Business
 - Recommendations for Welding in the World
 - Satisfaction Survey
 - Preparations for Upcoming Annual Assemblies and Intermediate Meetings

- [31] 1445: The effect of CrFeNb inoculant on the microstructural evolution and mechanical behaviors of IN718 superalloy fabricated by laser selective melting
Peixin Yang, Haijun Su, YINUO Guo (China)
Doc. I-1597-2024
- [32] 1505: Multi-component and multi-phase field modelling of solidification microstructural evolution in Inconel 625 alloy during laser powder bed fusion additive manufacturing process
Soma Maji, Murugaiyan Amirthalingam (India)
Doc. I-1598-2024
- [33] 1525: Manufacturing of NiTi Alloy with Functional Gradation Using Dual Wire Electron Beam Additive Manufacturing
Amber Black, Andrew Duffield, Mark Sandoval, Jacob Mingear (USA)
Doc. I-1610-2024
- [34] 1545: **Continuation of Commission I Administrative Tasks**

Coffee Break (1615– 1645)

- [35] 1645: Production and use of titanium biomedical alloy powder of the Ti-Zr-Nb system in the metal cored wire for WAAM technology
Sergiy Schwab, R.V. Selin, M.M. Voron (Ukraine)
Doc. I-1611-2024
- [36] 1705: A Study on Tool Path Strategy to Improve build Accuracy of Wire Arc-DED
Chang Jong Kim, Seok Kim, Young Tae Cho
Doc. I-1612-2024
- [37] 1725: In-situ surface structure analysis in laser powder bed fusion using optical high-resolution process monitoring
Jonathan Schmidt, Benjamin Merz, Gunther Mohr, Kai Hilgenberg (Germany)
Doc. I-1614-2024
- [38] 1745: Development and implementation of in-situ gas cooling to controlled influence cooling rate and component properties during DED-Arc of high-alloy steels
Maximilian Gierth, Jorg Hildebrand, Jean Pierre Bergmann (Germany)
Doc. I-1615-2024

1805: Continuation of Commission I Administrative Tasks

Adjournment of the 2024 C-I Meeting

Thursday 11 July 2024, 0855 -1830 @ Executive B Joint Meeting of C-I, C-IV, and C-XII

Morning Session, 0855-1300 Session 5: Chair: Matteo Pedemonte

- [40] 0855: International Additive Manufacturing Qualification System for Personnel
Ana Beatriz Lopez, Adelaide Almeida, Rita Bola
Doc. XII-2721-2024/I-1600-2024/IV-1637-2024
- [41] 0915: Influence of energy input and interpass temperature on the mechanical properties of DED-arc manufactured 316L
Markus Kohler, Ian Schubnell, Klaus Dilger (Germany)
Doc. XII-2722-2024/I-1601-2024/IV-1638-2024
- [42] 0935: Understanding and Overcoming the Challenges in the Welding of Additively Manufactured Aluminium Alloys
Rafael Nunes, Koen Faes, Wim Verlinde, Wim De Waele, Matthieu Lezaack, Aude Simar (Belgium)
Doc.XII-2723-2024/ I-1602-2024/ IV-1639-2024
- [43] 0955: Pathway to Qualification for DED-wire Additive Manufacturing
Teresa Melfi, Mark Douglass (USA)
Doc. XII-2724-2024/I-1603-2024/IV-1640-2024
- [44] 1015: Wire arc additive manufacturing of high strength Al-Mg-Si alloys
Andreas Pittner, Rene Winterkorn, Cagtay Fabry, Michael Rethmeier (Germany)
Doc. XII-2725-2024/I-1604-2024/IV-1641-2024
- [45] 1035: Presentation by WiiW
John Lippold (IIW)

Coffee Break (1045– 1115)

Session 6: Chair: Gunther Mohr

- [46] 1115 Effect of process mode and parameters on the bead geometry of Wire and Arc Directed Energy Deposited low alloy steel

Cui Seow (UK)

Doc.XII-2726-2024/ I-1605-2024/IV-1642-2024

[47] 1135: Effect of deposition strategies on mechanical properties and residual stresses at the transition zone of component and substrate in hybrid DED-arc manufacturing

Ronny Scharf-Wildenhain, Lorenz Engelking, Andre Haelsig, Dirk Schroepfer, Thomas Kannengiesser, Jonas Hensel (Germany)

Doc. XII-2727-2024/I-1606-2024/IV-1643-2024

[48] 1155: The effect of Cryogenic cooling on the microstructure and mechanical properties of Wire and Arc Additively Manufactured steels

Constantinos Goulas, Marco Ameye, Maximus Akuh, Remco Rook, Jose Luis Galan Argumedo, Theodoros Michelis, Wei Ya, Ian Gibson, Marcel Hermans (The Netherlands/Belgium)

Doc.XII-2728-2024/ I-1607-2024/ IV-1644-2024

[49] 1215: Experimental and simulation approaches to hydrogen embrittlement behaviour of additively manufactured metals and components

Masoud Moshtaghi (Finland)

Doc. XII-2729-2024/I-1608-2024/IV-1645-2024

[50] 1235: Investigations on the additive manufacturing of structures made of copper-zinc alloys using wire and arc-based welding processes

Malte Schop, Tim Ungethum, Hans Christian Schmale (Germany)

Doc. XII-2730-2024/ I-1609-2024/IV-1646-2024

1255: Close Out of First Day Joint Meeting of C-I, C-IV, and C-XII – D. Kautz