“Pioneer in Welding Technology and Non-Destructive Testing in Turkey”

Welding Technology and NDT Research/Application Center (WTNDT) takes its legal entity from the Middle East Technical University (METU), and it is directly administered by to the Office of the President. WTNDT was founded within the frame of a bilateral project (1988-1996) between Turkish and German governments. BAM-Berlin, DZG/ZIP and SLV-München were actively contributed to this project by providing training and sending short- and long-term experts. Since its official establishment in 1991 METU has been making very important contributions to Turkish industry for training and certification of level 1 and 2 NDT experts, international welding engineers; and also for research and application of NDT and welding techniques.

WTNDT Center has been continuing its activities successfully without any interruption since 1988. The director of WTNDT is Prof.Dr. C. Hakan Gür, after the period of the founding director (Prof.Dr. Alpay Ankara, 1988-2007). Since 2007, the premises, laboratories and equipment of the Center have been renovated and upgraded by using the income of the Center. In 2012 a research and development group was established in order to improve the contribution of METU to the Turkish industry.

WTNDT leaded the establishment of the Turkish Section of the American Society for NDT; and also establishment of Turkish NDT Society.

Memberships: Full Member of IIW (International Institute of Welding).

Activities
• Training of International Welding Engineer (IWE) / Technologist / Specialist / Practitioner
• Training and certification of the welders and welding operators
• NDT training and certification (EN ISO 9712, ASNT SNT-TC-1A): UT, RT, MT, PT, VT, digital radiography
• Mechanical tests and Non-Destructive tests for industry
• Academic research studies, Industrial projects, Failure analysis.

• 3,269 participants have attended the NDT courses (5 methods, 2 levels).
• 1,895 international welding engineers and 5,500 welders have been trained and certified.
• WTNDT acted as the recognized ATB and examination center of GSI-SLV Munich. After recognition of Turkish ANB (ANB-TR) by IIW, WTNDT started to give IWE diploma through ANB-TR since April 2011.

METU Welding and NDT Personnel Certification Center (METU-PCC) acts as an accredited certification body (by Turkish Accreditation Council- TURKAK) according to EN ISO 17024, EN ISO 9712 (NDT operator, level 1 and 2), EN ISO 9606-1 (steel welder), and EN ISO 9606-2 (aluminum welder).

Mechanical Tests
Mechanical tests laboratory has been working under TURKAK accreditation according to EN ISO/IEC 17025, including tensile test (ISO 6892-1, ISO 4136, API 1104, ASME Sec IX, AWS D1.1, AWS D1.5, ASTM A370, ASTM E8), hardness test (ISO 6507-1, ISO 9015-1, ANSI/AWS B4.0, ASTM E384), charpy impact test (ISO 148-1, ISO 9016, API 1104, ASME Sec IX, AWS D1.1, AWS D1.5, ASTM A370, ASTM E23), bending test (ISO 5173, API 1104, ASME Sec IX, AWS D1.1, AWS D1.5, ASTM A370, ASTM E190), nick-break test (API 1104), macroscopic examinations (ISO 17639, API 1104, ASME Sec IX, AWS D1.1, AWS D1.5, ASTM A340) and CTOD fracture toughness tests (ASTM E1290, ASTM E1820, ISO 15653, ISO 12135).

Projects
Trans Anatolian Pipeline Project (TANAP) is globally the biggest pipeline project for delivery natural gas from Azerbaijan to Turkey and Europe that is 1850 km and constructed under one management agent. 3 fabrication consortiums with 10 pipe mills, 4 construction consortiums and several vendors provide services to the project. R&D Division of WTNDT has provided about 90% of structural integrity and mechanical testing requirements of the project. R&D division has also been involved in fitness for service/purpose assessments and failure analyses for last 4 years.

Academic Activities
WTNDT gives laboratory support for the welding and NDT undergraduate and graduate courses in the departments of Metallurgical and Materials Engineering and Mechanical Engineering of METU. The number of completed MSc and PhD theses on welding and NDT is about 55; the number of publications in journals and congresses is more than 90.
## Completed MSc. and PhD. Theses

<table>
<thead>
<tr>
<th>Year</th>
<th>Title</th>
<th>Advisor</th>
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<tbody>
<tr>
<td>2019</td>
<td>Effects of Heat Input and Thermal Cycles to the Fracture Toughness of API 5L Grade X70M Steel Welded by Gas Metal Arc Welding</td>
<td>E. Erol</td>
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<td>2018</td>
<td>Investigating The Fracture Behaviour of X70M Linepipe Girth Weldments via Single Edge Notched Tension and Bend Tests</td>
<td>U. Tosun</td>
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<td>2018</td>
<td>Microstructure Control of AISI 4135 for Optimization of Fatigue and Fracture Performance</td>
<td>B. Özcan</td>
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<td>2018</td>
<td>Determination of Shot Peening Effect on Fatigue Behaviour of AISI 4140 Steel by Non-Destructive Measurement of Surface Residual Stresses</td>
<td>S. Çalışkan</td>
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<td>2017</td>
<td>Non-Destructive Evaluation of Residual Stress State in Carburized AISI/SAE 8620 Steel</td>
<td>T. Kaleli</td>
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<td>2017</td>
<td>Fracture Behaviour Differences of API-5L-X70 Steel which are Joined via Submerged Electrode Arc Welding and Gas Metal Arc Welding</td>
<td>M. Çağrıncı</td>
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<td>2016</td>
<td>Numerical Investigation of Residual Stresses, Distortion and Microstructure Evolution in Multi-Pass Welded Steel Components</td>
<td>N. Garipova (PhD)</td>
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<td>2016</td>
<td>Utilization of Friction Stir Processing to Improve the Mechanical Properties of Gas Metal Arc Welded 5083 Aluminum Alloy Plates</td>
<td>S. Firouzeh</td>
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<td>2016</td>
<td>Nondestructive Monitoring of Variations in Microstructure and Residual Stress in Carburized Steels</td>
<td>H. Hızlı</td>
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<td>2015</td>
<td>Effect of Friction Stir Processing on Fracture Toughness and Crack Growth Behaviour of Fusion Welded 5083 Grade Aluminum Plates</td>
<td>G. Akçay</td>
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<tr>
<td>2014</td>
<td>Effects of Friction Stir Processing on Microstructure and Fatigue Crack Growth Behaviour of Gas Metal Arc Welded Al-Alloy</td>
<td>C. Yazganarkan</td>
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<td>2013</td>
<td>Kinetics &amp; Microstructural Analysis of Fatigue Fracture Progress in Weld Joints of DSS Grade 2205 Steels by Magnetic Barkhausen Noise</td>
<td>K.Yurtışık (PhD)</td>
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<td>2013</td>
<td>Investigating the Effect of Deformation and Annealing Texture on Magnetic Anisotropy in Low-C Steel</td>
<td>F.Ü. Akçaoğlu</td>
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<td>2012</td>
<td>Microstructural &amp; Mechanical Characterization of Duplex Stainless Steel Grade 2205 Joined by Hybrid Plasma &amp; Gas Metal Arc Welding</td>
<td>B. Tolungüş</td>
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<td>2012</td>
<td>Non-Destructive Evaluation of Residual Stresses in the Multi-Pass Steel Weldments</td>
<td>G. Erian</td>
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<td>2011</td>
<td>Effect of welding parameters on the hot cracking behavior of 7039 aluminum - zinc alloy</td>
<td>M. Akkus</td>
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<td>2010</td>
<td>Microstructural / mechanical characterization of MAG welded joint between cast iron &amp; low-C steel</td>
<td>M.T. Ertürk</td>
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<td>2010</td>
<td>Monitoring Variation of Surface Residual Stresses in the Shot-Peened Steel Components by Magnetic Barkhausen Noise Method</td>
<td>S. Savaş</td>
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<td>2009</td>
<td>Determination of Residual Stress State in Steel Weldments</td>
<td>H. I. Yelbay</td>
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<td>2009</td>
<td>Characterization of Ultra-Fine Grained Steel Samples Produced by High Pressure Torsion via Magnetic Barkhausen Noise Analysis</td>
<td>S. Bayramoğlu</td>
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<td>2009</td>
<td>Effect of filler material on hot cracking susceptibility of 5XXX series Al-Mg alloys (PhD)</td>
<td>S. Türktaş</td>
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<td>2006</td>
<td>Effect of Welding Parameters on the Susceptibility to Hydrogen Cracking in Line Pipe Steels in Sour Environment</td>
<td>O. Yaşar</td>
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<td>2006</td>
<td>Estimation of Heights of Surface Breaking Cracks Using Ultrasonic Timing Methods</td>
<td>E. Öztürk</td>
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<td>2006</td>
<td>Characterization of Dual Phase Steels by Using Magnetic Barkhausen Noise Analysis</td>
<td>M. Kaplan</td>
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<td>2005</td>
<td>Effect of Surface Roughness on Ultrasonic Testing</td>
<td>U. İşleyici</td>
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<td>2004</td>
<td>Determination of Welding Parameter dependent Hot Cracking Susceptibility of 5086-H32 Aluminum Alloy with the Use of MVT Method (PhD)</td>
<td>C. Batgün</td>
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<td>2004</td>
<td>Computerized Test Procedure for Industrial Radiographic Examination of Metallic Welded Joints</td>
<td>E.E. Güneş</td>
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<td>2004</td>
<td>Effect of Spheroidizing on Machinability Characteristics and Microstructure of Medium-C Steels</td>
<td>E. Yanardağ</td>
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<td>2003</td>
<td>Determination of Relationship between Weld Quality and Mechanical Strength in Different Steels</td>
<td>O.A. Soylu</td>
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<td>2003</td>
<td>Effect of Gap Distance on the Mechanical Properties and Cross-Sectional Characteristics of the MIG-MAG Butt Welds</td>
<td>İ. Kaşkıçı</td>
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<td>2003</td>
<td>Detection and Monitoring of Surface-Breaking Fatigue Cracks in Al 2024-T3 by Ultrasonic Methods</td>
<td>F. Sonat</td>
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<td>2003</td>
<td>Effect of Solid Couplants Made of Hydrophilic Polymers in Ultrasonic Testing</td>
<td>M. Çetin</td>
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<td>2003</td>
<td>Defect Assessment of Spot Welds by NDI</td>
<td>O.O. Koçak</td>
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Middle East Technical University (1956) - Ankara, Turkey

Welding Technology & Nondestructive Testing Research/Application Center

www.wtndt.metu.edu.tr
A. Selected Papers published in International Journals


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9. Gür CH, Nondestructive Monitoring of Pearlitic Degradation in Medium Carbon Steels by Magnetic Barkhausen Noise Method, 14th Int. Conf. of Slovenian Soc. for NDT, Slovenia, 155-161
10. Gür CH, non-destructive monitoring of pearlitic degradation in medium carbon steels by magnetic barkhausen noise method, 15th Int. Conf. of Slovenian Soc. for NDT, Slovenia, 155-161
16. Kaleli T, Gür CH, Non-Destructive Monitoring of the Effects of Carburizing on 1CrNi5H Steel by Magnetic Barkhausen Noise Method, 16th World Cong., for NDT 13-17 June 2016 Munich, CD Proc. Tu.2.C.1
17. Kaleli T, Gür CH, Non-Destructive Monitoring of the Effects of Carburizing on 1CrNi5H Steel by Magnetic Barkhausen Noise Method, 17th Int. Conf on Barkhausen Noise & Micromagnetic Testing, 24-26 Sep 2015 Dresden
18. Kaleli T, Gür CH, Non-Destructive Monitoring of the Effects of Carburizing on 1CrNi5H Steel by Magnetic Barkhausen Noise Method, 18th World Cong., for NDT 13-17 June 2016 Munich, CD Proc. Tu.2.C.1
23. Kaleli T, Gür CH, Non-Destructive Monitoring of the Effects of Carburizing on 1CrNi5H Steel by Magnetic Barkhausen Noise Method, 14th World Cong., for NDT 13-17 June 2016 Munich, CD Proc. Tu.2.C.1
25. Kaleli T, Gür CH, Non-Destructive Monitoring of the Effects of Carburizing on 1CrNi5H Steel by Magnetic Barkhausen Noise Method, 16th World Cong., for NDT 13-17 June 2016 Munich, CD Proc. Tu.2.C.1
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36. Kaleli T, Gür CH, Non-Destructive Monitoring of the Effects of Carburizing on 1CrNi5H Steel by Magnetic Barkhausen Noise Method, 18th World Cong., for NDT 13-17 June 2016 Munich, CD Proc. Tu.2.C.1

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40. Batıgün C., Tirkeş S., Effect of line energy on the weld geometry and Mg content of the weld metal in Mg welding of Al-Mg alloys. Welding Technology VI. National Congress, 9-10 Nov 2007 Ankara.


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49. Gür CH, Tuncer BO, Determination of the effect of quenching and tempering on AlSi/SAE 5140 steel by sound velocity measurements, 1st Jordanian Int Conf of Mater Sci and Eng, 3-5 May 2005 Al-Salt, 230-235


52. Gür CH, Prediction of Reinforcement State and Mechanical Properties of SiC Particle Reinforced Al-Matrix Composites by Transverse & Longitudinal Waves, 8th European Conf. on NDT, 17-21 June 2002, BarcelonaGür CH, Ultrasonic investigation of SiC-particle reinforced aluminium matrix composites, DGZIP-Annual Congress. 05-07 May 2002 Weinmar.

