13th International Aluminium Conference

INALCO
naples 2016

New structures for aluminium and new aluminium for structures

NAPLES - ITALY
SEPTEMBER 21-23
FOREWORD

The “13th International Aluminium Conference” is organized in Naples on 21-23 September, 2016 by the Department of Structures for Engineering and Architecture and the Department of Chemical, Materials and Industrial Production Engineering of the University of Naples “Federico II”.

The first international conference on welded products and constructions with aluminium alloys was held in Cleveland (USA) in 1979. It became established as INALCO at the 2nd conference in Munich in Germany in 1982. Since then, these conferences have been held every three years in different venues all over the world. The latest editions were held in Osaka (Japan, 2007), Eindhoven (The Netherlands, 2010) and Montreal (Canada, 2013).

The INALCO Conference aims at presenting relevant topics for various aluminium products and constructions such as: Technology, Structural Behaviour and Applications, Architecture, Environment and Techno-Ecology. The programme will consist of keynote lectures by invited speakers as well as oral and poster presentations of papers submitted by attendees.

This Conference is a gathering of academics, research and development professionals, sales and marketing executives, plant and industrial engineers, quality-control managers, packaging experts, and other prominent aluminium industry leaders.

The results of recent research activity from all over the World in the field of aluminium constructions are represented by 71 papers of experts from 24 Countries (Algeria, Austria, Belgium, Brazil, Canada, China, Croatia, Finland, France, Germany, Greece, Italy, Japan, Montenegro, Norway, the Netherlands, Poland, United Kingdom, Serbia, Slovakia, Spain, United States, Sweden, Hungary). The papers included in the proceedings are subdivided in Chapters and the same subdivision corresponds to the Working sessions of the 13th INALCO Conference. The working session are categorized into the following areas:

1. New trends of aluminium alloys constructions
2. Advanced connecting systems
3. Aluminium surface treatments
4. Numerical and experimental analysis methods
5. Structural capacity of aluminium elements
6. Large span structures
7. Codification

The programme will consist of oral and poster presentations. Three out-standing international experts are invited as keynote speakers: Michele Curioni, from the University of Manchester (UK), who treats the question “Will Aluminium Structures last forever?”; Dimitris Kosteas, from the Technical University of Munich (Germany), who reports on the general issue “Sustainability, Durability and Structural Advantages as Leverage in Promoting Aluminium structures”; Steinard Lundberg, from the Hydal Aluminium Profiler company (Norway), who illustrates the main advances in the “Use of Aluminium Structures in the Offshore industry”.

The Chairs wish a great success to this INALCO Conference edition, which for the first time joins together the world of Structural Engineering to the world of Technological Engineering, for enhancing every way of a more fruitful cooperation among all involved stakeholders, like scientists, professionals, associations, companies, operating in the field of the development, promotion, diffusion of the aluminium alloy constructions, with the consciousness that only through this synergy it is possible to face such an enthusiastic challenge.

Federico M. Mazzolani
Francesco Bellucci
CONFERENCE STAFF

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Ph. +39 081 7611085 - 668774 Fax +39 081 664372
E-mail: inalco2016@mcmcongressi.it
GENERAL INFORMATION

CONFERENCE DATES
September 21 - 23, 2016
Napoli, Italy

CONFERENCE VENUE
School of Polytechnic and Basic Sciences, College of Engineering,
P.le V. Tecchio, 80 - 80125 Napoli, Italy

ON-SITE SECRETARIAT
September 21, Wednesday 08:00-18:00
September 22, Thursday 08:30-18:00
September 23, Friday 08:30-14:00

ON-SITE REGISTRATION FEES
Regular Participants € 700,00
Students* € 500,00
* (for participants born in 1983 or later)
Please note that registration fees include VAT 22% as per Italian Law.

The registration fees include:
Regular Participants/Students
• Badge and admission to all sessions
• Lunches
• Coffee breaks
• Final program and proceedings volume
• Welcome cocktail on September 21
• Social dinner on September 22

Registration fee does not cover:
• Accommodation
• Meals and drinks, other than those provided as part of the conference program

OFFICIAL LANGUAGE
The official language of the Conference is English; please, note that translation facilities will not be provided.

CONFERENCE BADGE
Everyone is kindly requested to wear his/her name badge during the Conference as it provides access to the scientific sessions, lunches, coffee breaks and welcome cocktail.

LUNCHES AND COFFEE BREAKS
Coffee breaks and lunches will be served during the conference days according to the program timetable.

INTERNET
Free Wireless internet access will be available at the conference venue.

ORAL PRESENTATIONS
Time at disposal for oral presentation is 12 minutes plus 3 minutes for discussion.
Audiovisual facilities will be available (PC with Power Point and videoprojector).

SLIDES CENTER
Technicians will be at your service at the following hours:
September 21, Wednesday 08:00-17:00
September 22, Thursday 08:30-17:00
September 23, Friday 08:30-13:00
All Speakers should check and upload their presentation not less than 1 hour before the beginning of their session. Speakers at the morning sessions are required to upload their slides no later than h. 17:00 on the day before their session is scheduled.

POSTER PRESENTATIONS
The Poster exhibition will be available during the whole conference. The Poster presentation by Authors will be held on Thursday, September 22 from h. 14.15 to 16.00 in the room “Biblioteca F. Gasparini”.
On that occasion authors are kindly requested to be at their poster for poster discussion.

SOCIAL PROGRAMME
WELCOME COCKTAIL
Date and time: Wednesday, September 21 / 19:00-20:00
Venue: Hotel Palazzo Esedra
Address: P.le V. Tecchio, 50 Napoli (just opposite the Conference venue)
Dress code: smart casual

GALA DINNER
Date and time: Thursday, September 22 / 20:00-23:00
Venue: Bertolini’s Hall
Address: Corso Vittorio Emanuele, 165/b Napoli
Additional tickets can be purchased at the secretariat desk by Wednesday September 21 at h. 16:00, upon availability of places. The price of the ticket is € 90,00
Dress code: Formal
Kindly offered by Laminazione Sottile.

HOW TO REACH THE CONFERENCE VENUE
The best way to reach the conference venue is the Underground (M) Line 2 with stop at the Campi Flegrei Station.
A public bus transportation service is available throughout the city. Find your route to the Conference Venue at the following website: www.anm.it. On the same website information and maps of Undergrounds, Buses, Cable Cars are available.
Several taxi companies are available from taxi stations throughout the city and at the following phone numbers:
081 202020
081 5707070
081 5666666
## GENERAL PROGRAMME

### Wednesday, September 21, 2016

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<td>8.00</td>
<td>Registrations</td>
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<td>9.00 - 9.30</td>
<td>Opening ceremony</td>
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| 9.30 - 10.15| **Keynote 1**  
Michele Curioni |
| 10.15 - 10.45| **Coffee break**                          |
| 10.45 - 12.45| Numerical and experimental analysis methods |
| 12.45 - 13.00| Sponsor talk                              |
| 13.00 - 14.00| **Lunch**                                 |
| 14.00 - 16.00| New trends in design and production of aluminium alloys constructions |
| 16.00 - 16.30| **Coffee break**                          |
| 16.30 - 18.15| Large span structures                      |
| 19.00 - 20.00| **Welcome cocktail**                      |

### Thursday, September 22, 2016

<table>
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| 9.00 - 9.45| **Keynote 2**  
Dimitris Kosteas |
| 9.45 - 10.45| Advanced connecting systems 1               |
| 10.45 - 11.15| **Coffee break**                          |
| 11.15 - 13.15| Structural capacity of aluminium elements |
| 13.15 - 14.15| **Lunch**                                 |
| 14.15 - 14.30| Sponsor talk                              |
| 14.30 - 16.00| Poster Session                            |
| 15.30 - 16.00| **Coffee break**                          |
| 16.00 - 18.00| Aluminium Surface treatments               |
| 20.00       | **Gala Dinner**                            |

### Friday, September 23, 2016

<table>
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<th>Time</th>
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| 9.00 - 9.45| **Keynote 3**  
Steinar Lundberg |
| 9.45 - 10.45| Advanced connecting systems 2               |
| 10.45 - 11.15| **Coffee break**                          |
| 11.15 - 13.15| Codification                             |
| 13.15 - 13.30| **Closing session**                      |
**PROGRAMME**

**WEDNESDAY, SEPTEMBER 21**

**08.00**
Registrations

**09.00 - 09.30**
Room Aula Magna - Opening ceremony

Gaetano Manfredi  
Rector of the University of Naples Federico II

Piero Salatino  
President of the School of Polytechnic and Basic Sciences

Francesco Bellucci  
Co-Chair

Federico M. Mazzolani  
Chair

**09.30 - 10.15**
KEYNOTE 1  
Chair: Airan Perez

Will Aluminium Structures Last Forever?  
Michele Curioni  
(University of Manchester, Corrosion and Protection Centre, UK)

**10.15 - 10.45**
Coffee break

**10.45 - 12.45**
NUMERICAL AND EXPERIMENTAL ANALYSIS METHODS  
Chair: Ivan Balaz, Alberto Mandara

Proposal for an Empirical Evaluation of Rotation Capacity of RHS Aluminium Alloy Beams Based on FEM Simulations  
Paolo Castaldo, Elide Nastri, Vincenzo Piluso

Numerical analysis of aluminium perforated shear panels  
Giuseppe Brando, Gianfranco De Matteis

**12.45 - 13.00**
Sponsor Talk: Innovation Management  
Marco Frizzarin (AYMING)

**13.00 - 14.00**
Lunch

**14.00 - 16.00**
NEW TRENDS IN DESIGN AND PRODUCTION OF ALUMINIUM ALLOYS CONSTRUCTIONS  
Chair: Tullio Monetta, Victor Songmene

Overview of the correlations between process parameters, microstructure and mechanical properties of Reference castings and industrial demonstrators  
Eleonora Battaglia, Franco Bonollo, Elena Fiorese, Giorgio Kral
Characterization of innovative Al-Si-Mg-based alloys for high temperature applications.
Elisabetta Gariboldi, Marco Colombo

Incremental ECAP as a method to produce ultrafine grained aluminium plates
Malgorzata Lewandowska, Witold Chrominski, Marta Lipinska, Lech Olejnik, Andrzej Rosochowski

Design of Functionally Graded Beam of Aluminium Foam for Civil Structural Application
Gianpaolo Perrella, Diana Faiella, Giuseppe Brandonisio, Massimiliano Fraidì, Elena Mele

Turning and Drilling Machinability of Recycled Aluminum Alloys
Jean Brice Mandatsy Moungomo, Donatien Nganga Kouya, Victor Songmene

Properties of Aluminium Alloys Produced by Selective Laser Melting
Paola Bassani, Carlo Alberto Biffì, Riccardo Casati, Adrianni Zanatta Albancon, Ausonio Tuissi, Maurizio Vedani

Research on mechanical and electrical properties of wires made from composites of aluminium-graphene and aluminium-nanotubes
Marek Gniełczyk, Beata Smyrak, Tadeusz Knych, Grzegorz Kiesiewicz, Pawel Kwaśniewski, Andrzej Mamala, Artur Kawecki, Bartosz Jurkiewicz, Małgorzata Zasadzińska

Think light: Cost and weight reduction by choosing Aluminium for Offshore Constructions
Dick de Kluijver

16.30 - 18.15 LARGE SPAN STRUCTURES
Chairs: Randy Kissel, Elena Mele

Rapid Deployment Aluminium Bridge
Alex de la Chevrotière

The use of structural aluminum for the design of large span roofs: the case of the “Cubierta de Oviedo”
Beatrice Faggiano, Giacomo Iovane, Alessia Ricci, Antonino Squilace, Antonello Astarita, Francesco Passeggio, Alfonso F. Cantelli, Federico M. Mazzolani

Aluminium Bridges
Sebastien Joux

Aluminium in modular structures for offshore lifts
Vasiliki Ntaskagianni

Conceptual design of an aluminium bridge in Alma, QC
László Gergely Vigh, Gábor Schnierer, Judit Buchmüller, Ákos Pohl, Bence Turányi, László Kiss, Lyne St-Georges, Louis Dussault

Analysis of lowering effects in aluminum single-layer latticed dome with Temcor joints
Shuai Xu, Zhihua Chen, Federico M. Mazzolani

Structural design and analysis of Aluminum Dome for Caofeidian Coal Storage
Zechao Zhang, Hongbo Liu, Xiaodun Wang, Xiangyu Yan, Jinhai Yu, Zhihua Chen

19.00 - 20.00 Welcome Cocktail
THURSDAY, SEPTEMBER 22

09.00 - 09.45  
**KEYNOTE 2**  
*Chair: Ronald Latanision*  
Sustainability, Durability and Structural Advantages as Leverage in Promoting Aluminium Structures  
Dimitris Kosteas (*Technical University of Munich, Germany*)

09.45 - 10.45  
**ADVANCED CONNECTING SYSTEMS 1**  
*Chairs: Johan Maljaars, Vincenzo Piluso*  
Performance of friction stir welded tailor welded blanks in AA5059 and AA6082 alloys for marine applications  
Eduardo E. Feistauer, Luciano Bergmann, Jorge F. dos Santos

  Practical Design of Aluminium Silos according to EC9-1-5  
  Peter Knoedel, Thomas Ummenhofer

  Pull-Out Strength of Screws in Screw Chases: Part 1  

  Pull-Out Strength of Screws in Screw Chases: Part 2  

10.45 - 11.15  
**Coffee break**

11.15 - 13.15  
**STRUCTURAL CAPACITY OF ALUMINIUM ELEMENTS**  
*Chairs: Gianfranco De Matteis, Dianne Van Hove*  
Torsional-Flexural Critical Force for Various Boundary Conditions  
Ivan Baláž, Michal Kováč, Tomáš Živner, Yvonna Koleková

Materials Performance and Design analysis of Suspension Lower-Arm Fabricated from Al-Si-Mg Castings  
Khaled Ahmed Ragab, Mohamed Bouazara, Amine Bouaicha, Hatem Mrad

Novel Morphologies of Aluminium Cross-Sections through Structural Topology Optimization Techniques  
Lukas Grekavicius, Jack Antony Hughes, Konstantinos Daniel Tsavaridis, Evangelos Efthymiou

Theoretical Analysis of the Possibilities for Aluminium Alloy Beam to be Strengthened Using Elements of Steel  
Boris Gligic, Dragan Budjevac, Zlatko Markovic

A simple method for the design of aluminium structures  
Torsten Höglund

Deformation of perforated aluminium plates under in-plane compressive loading  
Irene Scheppeboer, Evangelos Efthymiou, Johan Maljaars

Plate stability verifications of aluminium plate girders  
László Gergely Vigh, Dib Abdelkarim

13.15 - 14.15  
**Lunch**

14.15 - 14.30  
**Sponsor talk: ISO 31000, principles and guidelines for risk management. A framework useful for managing the risks associated to the production processes and environmental impact.**  
Laura Schiavon (CROWE HORWATH AS)

14.30 - 16.00  
**BIBLIOTECA F. GASPARINI - POSTER SESSION**  
**ADVANCED CONNECTING SYSTEMS**

P1  
Bearing Capacity of aluminum bars with built-up cross section and glued or welded connections  
Marcin Krajewski, Piotr Iwicki

P2  
Joining Mechanism of Dissimilar Materials Such As Metal and Plastic Sheets by Friction Lap Joining  
Toshiya Okada, Kazuhiro Nakata, Masatoshi Enomoto
NEW TRENDS IN DESIGN AND PRODUCTION OF ALUMINIUM ALLOYS CONSTRUCTIONS

P3
Localized corrosion resistance of dissimilar aluminum alloys joined by Friction Stir Welding (FSW)
Aline F.S. Bugarin, Fernanda M. Queiroz, Maysa Terada, Hercilio G. de Melo, Isolda Costa

P4
Aluminium Footbridges over the Rail Demonstrating Versatility and Economy
Dimitris Kosteas, Alexandros Kosteas-Kostaropoulos

P5
Research on the fatigue strength of aluminium EN AW 1370 wires
Bartosz Jurkiewicz, Beata Smyrak, Tadeusz Knych, Andrzej Mamala, Andrzej Nowak, Michał Jabłoński, Kinga Korzeń, Marek Gnielczyk, Małgorzata Zasadzińska

P6
The influence of strain and precipitation hardening on the mechanical and electrical properties of EN AW 6101 wires
Małgorzata Zasadzińska, Bartosz Jurkiewicz, Beata Smyrak, Tadeusz Knych, Andrzej Mamala, Michał Jabłoński, Kinga Korzeń, Andrzej Nowak, Marek Gnielczyk

P7
Aluminium Machining Chips Formation, Treatment & Recycling: A review
Jean Brice Mandatsy Moungomo, Donatien Nganga Kouya, Victor Songmene

NUMERICAL AND EXPERIMENTAL ANALYSIS METHODS

P8
Experimental and numerical researches on aluminium alloy systems for structural applications in civil engineering fields
Antonio Formisano, Gianfranco De Matteis, Federico M. Mazzolani

P9
Design and performance testing of a skylight in Qatar
Muhammad Tayyab Naqash, Antonio Formisano, Gianfranco De Matteis

STRUCTURAL CAPACITY OF ALUMINIUM ELEMENTS

P10
Resistances of I-Section to Internal Forces Interactions
Ivan Baláž, Michal Kováč, Tomáš Živner, Yvonna Koleková

P11
Aluminium Framing Members in Facades
Muhammad Tayyab Naqash, Antonio Formisano, Gianfranco De Matteis

P12
Ultimate load bearing capacity of web members of lattice aluminium structures made of CHS profiles
Djordje Djuricic, Biljana Scepanovic, Mitar Misovic, Dusko Lucic

P13
Low-cycle Fatigue Testing of a Novel Aluminum Alloy Buckling-Restrained Brace
Ye Liu, Li Zhou, Chun-Lin Wang

ALUMINIUM SURFACE TREATMENTS

P14
On the effects of hydrothermal treatments on the corrosion resistance of the TSA anodized AA7475-T761 alloy
Thallis Leal Almeida, Fernanda Martins Queiroz, Maysa Terada, Isolda Costa, Vera Rosa Capelossi

P15
Effect of experimental parameters on passivation phenomena of Ti6Al4V alloy in acid solution
E. Nouicer, F.Z. Benlahreche, A. Nouicer

P16
Hydrothermal surface treatments with Cerium and Glycol molecules on the AA 2024-T3 clad alloy
Wagner Izaltino Alves dos Santos, Isolda Costa, Célia Regina Tomachuk

15.30 - 16.00
Coffee break

16.00 - 18.00
ROOM AULA MAGNA - ALUMINIUM SURFACE TREATMENTS

Chairs: Isolda Costa, Ciro Sinagra

Loss of adhesion at Al 8006/LDPE interface in containers for food packaging: a case study
Tullio Monetta, Annalisa Acquesta, Ciro Sinagra, Donald Bryce Mitton, Francesco Bellucci
On the Investigation of the Portevin-Le Chatelier Effect in The Rolling Of AA 5083
Antonello Astarita, Mariacira Liberini, Carla Velotti, Ciro Sinagra, Antonino Squillace

Coil Coating: the advanced finishing technology
Sergio Bianchi, Fabrizio Broggi

Green Technology for Surface Treatments of Aluminium Foil for Flexible Packaging
Ciro Sinagra, Francesco Bravaccino, Ciro Bitondo, Antonio Bossio, Tullio Monetta, Donald Bryce Mitton, Francesco Bellucci

The use of Cold Spray to repair corroded AA6005A-T6 used for bolt-channel joints
Antonio Bossio, Ciro Bitondo, Anna Carangelo, Antonio Formisano, Tullio Monetta, Raffaele Landolfo, Federico M. Mazzolani, Francesco Bellucci

Products and Process for Guala Closures: An Overview of Aluminum Closures Production and the Drive for Innovation
Francesco Bove, Carlo Tagliabue, Maurizio Mittino

Corrosion protection of AA2524-T3 anodized in tartaric-sulfuric acid bath and protected with hybrid sol-gel coating
Hellen Costenaro, Fernanda Martins Queiroz, Maysa Terada, Marie-Georges Olivier, Isolda Costa, Hercilio Gomes de Melo

Production routes for impact extruded aluminum parts for the automotive industry
Alexander Wimmer, Bernhard Schwarz

FRIDAY, SEPTEMBER, 23

09.00 - 09.45
KEYNOTE 3 Chair: Beatrice Faggiano
Use of aluminium structures in the offshore industry
Steinar Lundberg (Hydal Aluminium Profiler AS, Norway)

09.45 - 10.45
ADVANCED CONNECTING SYSTEMS 2
Chairs: Evangelos Efthymiou, Antonino Squillace
Structural response of aluminium T-stub connections at elevated temperatures and fire
Johan Maljaars, Gianfranco De Matteis
Advances and potentials in Friction Stir Welding of aluminum alloys
Jean Pierre Bergmann, Michael Grätzel, René Schürer, Anna Regensburg, Markus Weigl
Macroscopic Modelling of Flow-Drill Screw Connections
Johan Koiste Senstabba, David Morin, Magnus Langseth
The effects of friction stir welding parameters on the characteristics of banded structure for aluminum alloys
Mariem Zoghlami, Mohammad Jahazim, Victor Songmene

10.45 - 11.15
Coffee break

11.15 - 13.15
CODIFICATION
Chairs: Torsten Höglund, Antonio Formisano
Analysis of aluminium beam-to-column joints by the component method: existing studies and research needs
Gianfranco De Matteis, Giuseppe Brando
Direct methods of plasticity in aluminium frames accounting for Eurocode 9 failure criteria
Alexios T. Ampatzis, Vasileios G. Psomiadis, Evangelos Efthymiou
Bearing length on cold-formed sections
Bert Norlin, Torsten Höglund

Recent Developments in North American Aluminum Structural Design Codes
J. Randolph Kissell

EC9 Second Generation: Proposal for New Imperfection Factors for Unstiffened Aluminium Shells
Federico M. Mazzolani, Torsten Höglund, Alberto Mandara

(Low-Cycle-) Fatigue Design according to DIN EN 1999-1-3. State of the Art and Current Research
Christina Radlbeck, Mathias Rengstl, Senta Pessel, Martin Mensinger

Lateral torsional buckling of split aluminium mullion
Davor Skejić, Mladen Lukić, Nebojša Buljan, Hrvoje Vid

Recent Development of Codes for Design of Aluminum Structures in Canada
Scott Walbridge, Denis Beaulieu, Federico M. Mazzolani

13.15 - 13.30
Closing session
SCHOOL OF POLYTECHNIC AND BASIC SCIENCES
GROUND FLOOR

FIRST FLOOR

Garden

Stairs to first floor

Escalator

Entrance

P.le V. Tecchio 80

Stairs to second floor

Escalator

Room Aula Magna

Secretariat Desk

WC