ASM-WEST

Second Annual Seminar Series Presents

Orange Coast **Los Angeles** **San Fernando**

Symposium on
Material and Design Challenges in Aerospace Fasteners

KEYNOTE ADDRESS:

Innovation and Competitiveness in the Global Aerospace Fastener Marketplace

by

Vitaliy V. Rusakov
President, Alcoa Fastening Systems

November 5th, 2012
8:30am to 5:00pm
University Club
801 East Peltason Drive
Irvine, CA 92697

Program

8:00 – 8:45	Registration and Continental Breakfast	
8:45 – 8:50	Introduction & Opening Remarks	
8:50 – 9:25	Lew Shoemaker Special Metal Corporation	Nickel Alloys & Superalloys for High Performance Fasteners for Aerospace & Other Demanding Applications.
9:00 – 9:35	Gary Novak, Ph.D., P.E. Engineering Systems Inc.	The Role of Fastener and Gasket Selection on Sealing System Performance
9:35 – 10:10	Liang Zeng, Ph.D. Alcoa Fastening Systems	A Thorough Research and Study of Titanium Fasteners, Is It Trivial?
10:10 – 11:00	Morning Break- Table Top Exhibits	
	Frauke Hogue IMECA	Challenges in the Interpretation of Fastener Microstructures
11:00 – 11:45	**KEYNOTE ADDRESS:** Vitaliy V. Rusakov **President, Alcoa Fastening Systems**	Innovation and Competitiveness in the Global Aerospace **Fastener Marketplace**
12:00 – 1:15	Luncheon at University Club	
1:15 – 1:50	Arvind Midha, P.E. Carpenter Technology	Aerospace alloy selection for the fastener industry.
1:50 – 2:25	Hasim Mulazimoglu, Ph.D. Alcoa Fastening Systems	Aluminum-Lithium Lockbolt Collar Development for Composite Structure Applications
3:00 – 3:30	Afternoon Break- Table Top Exhibits	
3:30 – 4:00	Daniel P. Dannies, Ph.D., P.E. Exponet Failure Analysis Associates	Microstructure Comparison of High Strength Inconel 718 Nuts
4:00 – 4:30	John Morgan Thermo fisher	Positive Material Identification of Critical Fasteners
5:00 – 5:15	Closing Remarks	

Keynote Adress:

Vitaliy V. Rusakov

President, Alcoa Fastening Systems

Innovation and Competitiveness in the global aerospace fastener marketplace

Alcoa Fastening Systems serves the aerospace, commercial transportation and industrial markets providing specialized engineered fastening solutions of the highest quality and the greatest variety of products.

Vitaliy Rusakov became President, Alcoa Fastening Systems (AFS) in February 2010. The business unit has more than 6,000 employees in 25 manufacturing sites and 7 distribution/logistics centers and operates in 11 countries.

Previously, Vitaliy was Vice President and General Manager of Operations, Alcoa Fastening Systems North America Aerospace, responsible for several facilities based in California, and led the implementation of AFS Strategic initiatives in Suzhou, China for these operations.

Vitaliy began his career in the fastening business in 1998 when he joined Fairchild Fasteners as a business development manager. After Alcoa acquired Fairchild Fasteners in 2002, Vitaliy became engaged in global strategic roles leading the integration of the AFS North America manufacturing and AFS Global logistics organizations into Alcoa. Earlier in his career in Ukraine, Vitaliy held consulting roles with Bain and Company, a global management consulting firm.

He holds a Bachelor’s degree in Linguistics and Education from Kiev University of Linguistics and a Bachelor’s degree in International Economic Relations from Kiev University of Economics. He obtained his MBA degree from Georgetown University, Washington, D.C.

Lew Shoemaker

Special Metals Corporation

Nickel Alloys & Superalloys for High Performance Fasteners for Aerospace & Other Demanding Applications

Abstract: Fasteners required for service under the demanding conditions that exist in many modern designs must offer ever-increasing levels of mechanical and physical properties as well as heat and corrosion resistance. As operating temperatures and pressures are increased to improve operating efficiency and the conditions of operation become more aggressive, the materials of their construction must constantly be improved to meet the demands of service. Nickel-base alloys and superalloys offer a unique set of properties for these high performance fasteners. Complex materials are specially designed to meet the rigors of specific applications. Alloy design aided by computer modeling has streamlined the development and enhancement of materials for specific applications. And, by improvements in melting and refining followed by special thermal mechanical processing, the properties of alloys, especially superalloys, can be optimized to meet the specific requirements of a demanding application.

Bio: Lew Shoemaker is Technical Sales Manager for Huntington Alloys / Special Metals Corporation … a PCC Energy Group company. Lew received his degree in metallurgical engineering from the University of Cincinnati. He has been employed by Special Metals Corporation for nearly forty years in research and development, technical services and marketing roles. In his current position he provides technical support to alloy users in determining the appropriate material for an application and how it can be properly fabricated. Lew's areas of expertise are alloy selection, corrosion, welding and fabrication. He is a member of NACE, ASM and AWS and has represented Special Metals on SAE / AMS, ASTM and ASME committees.

Gary Novak, PhD, PE

Engineering Systems Inc. (ESI),

The Role of Fastener and Gasket Selection on Sealing System Performance

Abstract: The fastener, gasket, and flange components of a bolted joint function as a system to provide a sealing function over a period of time under a range of load conditions. The design, assembly and loading of each component of the system have effects on that component as well as the others. Choices in the selection of fastening system, assembly process, and gasket technology are some of the factors that must be considered when evaluating the expected performance of the system for the specified flanges to be assembled and sealed. These choices will be examined in consideration of a number of concepts including: friction, stiffness, deformation, flatness, gasket clamp load and sealing. The effect on the expected performance of the system will be presented for some of the various factors.

Bio: Gary Novak, PhD, PE is a senior consultant at Engineering Systems Inc. (ESI), an engineering and scientific investigation and analysis firm. His consulting experience includes analysis and investigation of mechanical systems, fastening, sealing systems, vibration, powertrains, failure analysis, technology evaluations and intellectual property analysis. Prior to joining ESI, he held positions of Chief Technical Officer, Federal Mogul; Director of Advanced Technology, Fel-Pro; Research Professor, Rush Medical School; Senior Research Engineer, Borg Warner Automotive; and Stress Analysis Engineer, Chicago Bridge and Iron. He taught mechanical engineering undergraduate and graduate engineering classes at the University of Illinois. Dr. Novak has more than 20 years of industry experience including analysis, design and technical management with manufacturers of products including power train, structures, bolted joints, gaskets, pressure vessel piping, and machinery. Gary is a member of ASME, SAE and ASM and has over 25 publications and patents.

Liang Zeng, Ph.D.

Alcoa Fastening Systems

A Thorough Research and Study of Titanium Fasteners, Is It Trivial?

Bio: Dr. Liang Zeng is a Senior Metallurgist, New Product Development Center with Alcoa Fastening Systems since 06/10/2003. His role with the company is to conduct the research and development of products and manufacturing processes at the new product development center located Carson, California. Dr. Liang Zeng held Ph.D degree in Materials Science and Engineering from Michigan State University. Dr. Liang Zeng has been an active member of Aeromat committee, The Minerals, Metals, and Materials Society (TMS) Titanium committee, and ASM International (ASM).

Frauke Hogue
Metallographer

IMECA

Challenges in the Interpretation of Fastener Microstructures

Abstract: In order to assure high quality fasteners and the adherence to the procurement specifications, correct interpretation of metallographic specimens is of utmost importance. Challenges can arise from improper preparation, such as not removing Cd or Zn plating before mounting. Certain features can be highlighted or obscured, depending on the etchant selected to reveal the microstructure. One example of this is oxygen contamination or alpha case. Several examples will be demonstrated and discussed.

Bio: Frauke Hogue received her education in metallography and testing of materials at the Lette Verein in Berlin, Germany. In 1967 she moved to the Los Angeles area and worked for Voi-Shan, a manufacturer of aerospace fasteners, in the Quality Control laboratory for 10 years. At Voi-Shan she wrote training manuals, trained new technicians, and interfaced with customers and suppliers. In 1981 Frauke became an independent consultant in metallography, working mainly in the greater Los Angeles area, providing metallographic services to failure analysis companies. Since 1985 she has been teaching intensive courses at ASM International and at companies throughout the United States. Frauke developed "Practical Interpretation of Microstructures" in 1998 which consists of a collection of about 300 mounts and a notebook of annotated images of various materials and conditions. This was followed by "Metallography for Fasteners" and "Metallography for Failure Analysis". She has taught the “Metallography of Fasteners”course at companies throughout the LA area, the US and Canada.

ARVIND MIDHA, PE

Carpenter Technology Corporation

“Aerospace alloy selection for the fastener industry”

Abstract: A discussion on alloys offered for manufacture into fasteners for the aerospace industry will be discussed. A review of current fastener alloys for high strength, corrosion resistant and high temperature applications will be reviewed. A discussion on the most recent development for fastener alloys will also be discussed.

Bio: Currently serving as regional metallurgist of Western USA, Mexico & Latin America for Carpenter Technology Corporation, Specialty Alloys Operations. Professional Engineer with background in Metallurgical, Materials and Mechanical Engineering. Received B.A.Sc degree in Metallurgical and Materials Engineering from University of British Columbia, Vancouver, Canada. Expertise in the areas of Ni based, and Co based superalloys, titanium alloys, aluminum alloys, stainless steels, manufacturing engineering, new product development, materials evaluation & selection, failure analysis of components, corrosion engineering, heat treatment, quality assurance systems (six sigma, lean, FMEA, & DOE), project management, contract administration, employee training and maintenance engineering. Active on various technical committees in NASC, MMPDS, AIA & ASTM.

Hasim Mulazimoglu, Ph.D.

Alcoa Fastening Systems

Aluminum-Lithium Lockbolt Collar Development for Composite Structure Applications

Hasim Mulazimoglu[1]; Rodrigo Pinheiro[2] and Luke Haylock[2]

[1] Alcoa New Product Development, Aerospace Products, 900 Watson Center Road, Carson, CA 90745

[2] Alcoa New Product Development, Aerospace Fasteners, 3000 W. Lomita Blvd., Torrance, CA 90505

Abstract: Lightweight aerospace fastening collars were manufactured from aluminum-lithium alloy. The collars studied in this work were lockbolt collars with a controlled swaging feature and are to be used in a fastener assembly with a treated pin in composite joints. The mechanical properties of aluminum-lithium were compared to the ones made of incumbent materials such as 2024 and 3Al-2.5V Titanium. It was found that aluminum-lithium collars can provide a substantial weight saving and the equivalent mechanical properties. In addition, the corrosion characteristics of aluminum-lithium collars installed on carbon fiber composite were studied using the salt spray testing. This paper presents the results obtained from the mechanical and corrosion testing of the Al-Li collars along with the weight saving potentials of the new product.

Bio: Hasim Mulazimoglu is with Alcoa Fastening Systems and he is the manager of New Product Development Center and responsible for managing the research and technical support activities at Technology Center located in Carson, California. Hasim has been with Alcoa since 2007. Prior to his current role he was a senior metallurgical engineer at Textron Fastening Systems. Other positions he has held include Manager of Research and Development at American Racing Equipment and Research Associate at McGill University. Hasim holds bachelor's degree in Metallurgical Engineering from Middle East Technical University-Turkey, master's degree in Material Science and Engineering from Case Western Reserve University-Ohio and Ph.D. degree in Metallurgical Engineering from McGill University-Canada. He is also member of SAE and ASM.

Daniel P. Dennies, Ph.D

Exponent, Failure Analysis Associates

ASM Fellow

Microstructure Comparison of High Strength Inconel 718 Nuts

Abstract: The industry specifications for nuts and fasteners usually only specify hardness and strength requirements. For the majority of these specifications there are no controls for the microstructure, especially grain boundary precipitates. Various fabrication processes are employed by different suppliers to produce the same nut or bolt. This presentation compares the microstructure of a high strength Inconel 718 nut produced by two different suppliers and comments on the microstructures exhibited.

Bio: Dr. Dennies is a licensed metallurgical Professional Engineer (P.E.) in the state of California. He has over 30 years of experience in various raw material, forging, aerospace, and aircraft related industries as a technical specialist, technical manager, and program manager. The majority of his career has been in the aerospace industry working on projects such as the Space Shuttle Main Engine, the National Launch System, the National Aerospace Plane, expendable launch systems like Delta and Titan, and the International Space Station. He has also worked on other projects including commercial aircraft such as the Boeing 787, military aircraft such as the C17 Transport and B1-B Bomber, proprietary programs such as the Ground Based Missile Defense and the X-37B Experimental Reusable Unmanned Space Plane. In addition he has worked on projects concerning the biomedical devices, fasteners, and energy industries.

Positive Material Identification of Critical Fasteners

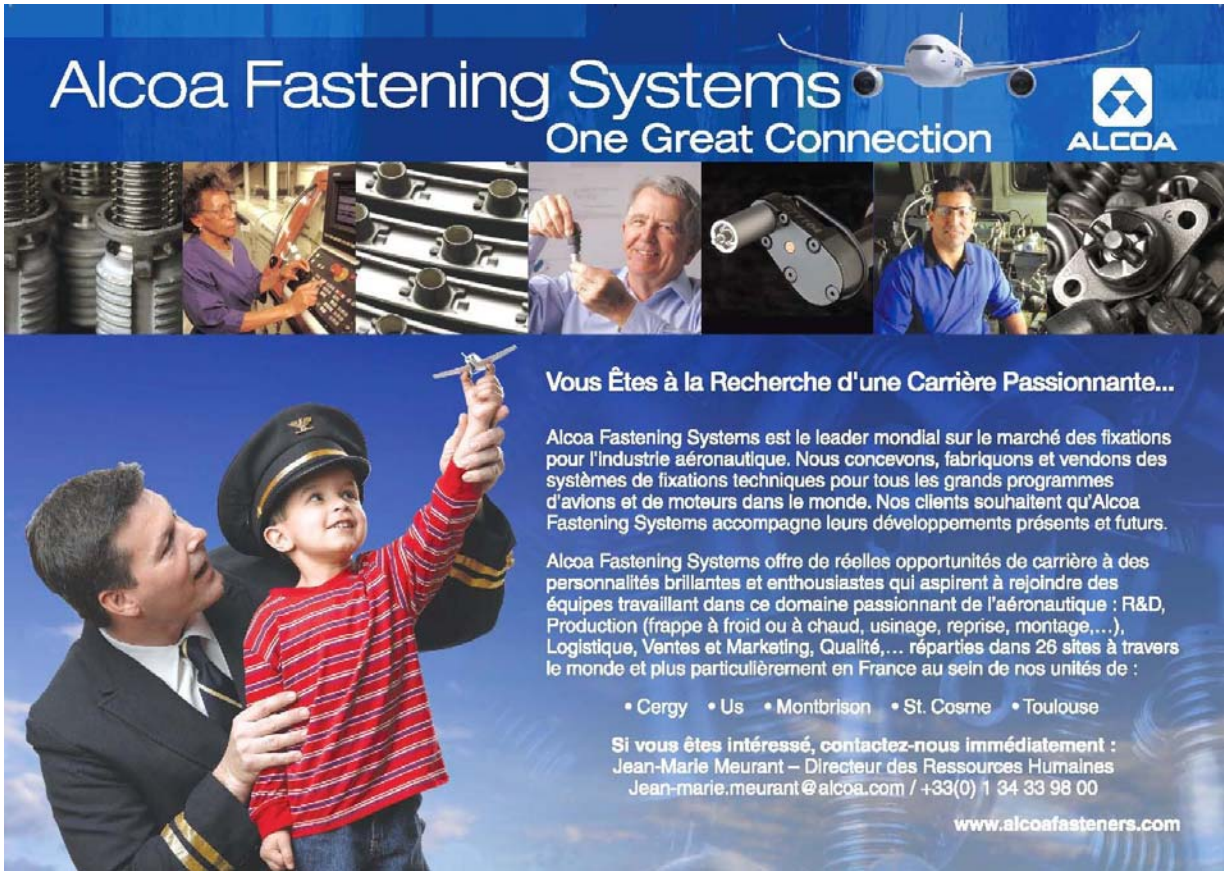
John Morgan, Dave Mercuro and David Del Rio

Thermo Fisher Scientific, Tewksbury, MA

Summary: Fasteners are such a ubiquitous component of so many machines and assemblies used on a daily basis that we tend to take them for granted, until something goes wrong. Fasteners, particularly those used in mission-critical situations, must be designed, fabricated, inspected, and installed properly or lives can be put at risk. For this reason, it is imperative to ensure that fasteners used in critical applications are made from the precise metal alloy called for in the design specifications. This verification can be accomplished quickly, easily, and accurately using a hand-held x-ray fluorescence (XRF) analyzer.

Despite the complex physics involved, the basic premise behind XRF technology is really quite simple. When exposed to external x-rays of a sufficient energy, each of the individual elements present in a sample will produce a unique set of characteristic fluorescent x-rays that are essentially a “fingerprint” for that specific element. An XRF analyzer collects and analyzes those characteristic x-rays to determine the elemental composition of the material being inspected.

Handheld XRF analyzers are used in a wide variety of applications from lead paint inspection to mining exploration to Positive Material Identification (PMI). Examples of PMI applications include identifying the exact alloy grades used in piping, valves, and flanges that transport hazardous chemicals in refineries or chemical plants. Another growing application is in the precious metals market, where XRF can determine the precise karat weight of gold coins and jewelry. In the fasteners market, XRF is used for inspection of incoming raw material to ensure it matches the alloy grade and composition documented on the material test report (MTR). It is also used for final quality inspection before finished parts are sent to the customer. This “double-check” process ensures that the incoming raw materials and the outgoing finished parts meet the expected engineering requirements.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