Shot Peening and its related processes are keeping pace with advancements in materials as evidenced by the quality of work presented at the Eleventh International Conference on Shot Peening

Shot Peening Research Keeps Pace with New Materials

I admit that most of the material presented at ICSP-11 was over my head. I enjoy reading a paper's Abstract, Introduction and Conclusion, but the actual research..not so much. I went to paper presentations, not because I hoped to understanding the data, but to meet the people that were capable of doing the work.

I didn't appreciate the real-life applications of the research until I started the article on new landing gear materials. In a stroke of luck, I picked up the ICSP-11 Proceedings and started thumbing through the Index. Titanium 6-4, Titanium Matrix Composites. High Strength Stainless Steels. They were all there—the materials that contribute to advancements in technology.

Now I see the International Conferences on Shot Peening in a new light. It's a gathering of the best minds in shot peening ***and*** the future of the shot peening industry. I've compiled a few of the new materials and related ICSP-11 papers but there were many more gifted academic and industrial researchers at ICSP-11 who are pushing the boundaries of shot peening. I provided the author's work affiliations—note the collaboration between universities and commercial facilities in many of the projects.

TITANIUM ALLOYS

Titanium 6-4 (Ti-6Al-4V) is still the workhorse of the titanium industry and accounts for over 50% of total titanium alloy production but new titanium alloys are moving in. Researchers are exploring the benefits of shot peening and other surface enhancements on titanium alloys including a study on shot peening and fatigue life of Ti-6Al-4V, a comparison of conventional shot peening to ultrasonic shot peening on aero-engine bladed disks, and shot peening and ball-burnishing on Timet's new titanium alloy: TIMETAL - 54M (Ti-5Al-4V-0.5M0-0.4Fe).

Paper Title:
Numerical Analysis of Shot Peening Effects on the Fatigue Life of a Titanium Alloy

Authors:
Bae, H.[1], Ramulu, M.[1], Flinn, B.[2], Diep, H.[3]

1 Department of Mechanical Engineering, University of Washington, Seattle, Washington
2 Department of Materials Science and Engineering, University of Washington, Seattle, Washington
3 The Boeing Company, Seattle, Washington

Paper Title:
Ultrasonic Shot Peening (USP) on Ti-6Al-4V and Ti-6Al-2Sn-4Zr-6Mo Aero Engine Components

Authors:
Stoll, I.[1], Helm, D.[1], Polanetzki, H.[1], Wagner, L.[2]

1 MTU Aero Engines GmbH, Munich, Germany
2 Department of Materials Science and Engineering, Technical University of Clausthal Clausthal, Germany

Paper Title:
Shot Peening and Ball-Burnishing to Improve HCF Strength of the New Titanium Alloy TIMETAL-54M

Authors:
Zay, K.[1], Shan, Y.[1], Kosaka, Y.[2], Wagner, L.[1]

1 Institute of Materials Science and Engineering Clausthal University of Technology, Germany
2 Timet Henderson Technical Laboratory Henderson, Nevada

TITANIUM MATRIX COMPOSITE

Titanium Matrix Composites (TMCs) are too expensive for current use but have great implications for automotive and aerospace components. The following papers explore the unique aspects of TMCs as related to shot peening: Their reinforced particles make the microstructure and residual stress distribution more complicated than in traditional metals, and the thermostability of composites after shot peening hasn't been widely studied. Substantiation of shot peening's benefits to TMC and the acceptance of TMC in the marketplace will greatly increase shot peening's scope of application.

Paper Title:
Application of the FEM for the Prediction of the Micro-Region Stress of TiB2/Al Composite

Authors:
Huang, J.[1], Bian, K.[1], Jiang, C.[1], Wang, Q.[2]

1 School of Material Science and Engineering, Shanghai Jiao Tong University Shanghai, P.R. China
2 Dafeng Daqi Metal Grinding Material Dafeng, P.R. China

Kathy Levy is a Technical Marketing Writer at InfoProse.

Paper Title:
XRD Investigation of Thermal Relaxation Behavior of Microstructure in TiB2/Al Deformation Layer Introduced by Shot Peening

Authors:
Luan, W.[1], Jiang, C.[1], Chen, X.[2]

1 School of Material Science and Engineering, Shanghai Jiao Tong University, Shanghai, P. R. China
2 Shanghai Carthing Machinery, Shanghai, P. R. China

HIGH-STRENGTH STAINLESS STEELS

"High strength stainless steels and age-hardenable super-alloys are rapidly gaining favor with designers in the aero-space, military and other industries who are challenged to meet higher performance expectations and stringent regulatory requirements at lowest life cycle cost," writes Anthony Guitterez, member of ASM International, in his article on high strength stainless steels for Carpenter Technology. Faculty members from the Academy of Armored Forces Engineering presented their work on 30CrMnSiNi2A, a low-alloyed steel widely used in Chinese aviation.

Paper Title:
The Effects of Ultrasonic-Aided Deep Rolling Process on Fatigue Performance of 30CrMnSiNi2A Steel

Authors:
Xie, J., Zhu, Y., Huang, Y.

Faculty of Remanufacturing Engineering
Academy of Armored Forces Engineering, Beijing, China

ALUMINUM LITHIUM ALLOYS

Aluminum-producer Alcoa intends to get back into the aerospace market with their Aluminum Lithium Alloy. Alcoa claims an airplane made with the new metal would be up to 10% lighter than composite-intensive planes, giving airlines additional fuel savings, and cost up to 30% less to make, operate and repair. Aluminum is also much more recyclable than other materials. "Once the airliner is sent to the desert for retirement, the aluminum airplane will be much easier to recycle into a new airplane than its composite cousins," wrote Jason Paur with www.wired.com

Aluminium lithium alloys were missing in the ICSP-11 Proceedings, probably because they aren't a commonly-used material. Curiously enough, researchers from the United Kingdom presented a paper on Aluminum Lithium Alloy at ICSP-3 in 1987. "A1-Zn-Mg alloys have been in use for many years, but recently alloys based on A1-Li have been developed with improved strength-weight ratios and it is thought that they may become widely used aircraft alloys in the 1990s,"[1] state the authors.

Paper Title:
The Effect Of Shot-Peening On Fatigue And Fretting Fatigue Behaviour Of 8090 And 7010 Aluminum Alloys

Authors:
Fair, G., Noble, B., Waterhouse, R.

Department of Metallurgy and Materials Science
University of Nottingham, United Kingdom

[1]C.J. Peel, B. Evans and D.S. McDarmaid: "Aluminium-Lithium Alloys III," Inst. Met. London (1986), 26.