IOWA STATE UNIVERSITY
Department of Mechanical Engineering

The Story of Thin

Scott Smith

Professor and Chair of Mechanical Engineering
University of North Carolina at Charlotte

Faculty host: James Michael

Seminar on September 18, 2018 at 11:00am in 2004 Black Engr. Bldg.

Abstract

In recent years, monolithic machined aluminum components have rapidly replaced sheet metal assemblies throughout the aerospace industry. The monolithic structures are lighter, less expensive, and stronger than their sheet metal counterparts. Monolithic structures require less special tooling, fewer hand operations, and less assembly time. This presentation describes the research activities and breakthroughs that led to the rise of monolithic components. The story starts with testing of high speed machining theories in the 1970's. In this time frame, it became clear that solid carbide tools would be quite capable of surviving the cutting temperatures in aluminum machining, and that a new class of machine tools would be required to support them. In the 1980's, as the design of spindles and machine tools advanced into the high speed range, the development of reliable chatter prediction tools began to dominate high speed machining research, and the drive to simplify the techniques for shop floor chatter avoidance became a powerful force. In the 1990's it became clear that there was growing value in the ability to produce very thin structures by machining, and research shifted to the cutting tool geometries and machining strategies required to manufacture thin components in the 1990's. By the late 1990's and early 2000's, the ability to produce very thin structures allowed the dramatic replacement of sheet metal assemblies by monolithic machined components. The trend is still underway, and machined monolithic components are still on the rise. This paper reviews the research history and the coupled business changes that radically changed aerospace manufacturing.

Dr. **Scott Smith** is Professor and Chair of Mechanical Engineering at the University of North Carolina at Charlotte. During 2012-13 he served as the Assistant Director for Technology at the US Advanced Manufacturing National Program Office in Washington DC.

He has been an engineering educator for more than 25 years at the University of Florida, and at the University of North Carolina at Charlotte. His teaching and research areas include high-speed machining, process optimization, and machine dynamics. He has taught numerous industrial short courses. He holds 11 patents.

Smith served as the Chair of the Manufacturing Engineering Division of ASME, and as an Associate Technical Editor of the ASME Journal of Engineering for Industry. He served as President of the North American Manufacturing Research Institute of SME, and as Chair of the SME International Awards and Recognition Committee. He served as Chair of the CIRP Editorial Committee, and Chair of the CIRP Machines Technical Committee. He is a founder and Vice-President of Manufacturing Laboratories, Inc., and he serves on the Board of Directors of BlueSwarf LLC. He is co-author of the books *Machining Dynamics: Frequency Response to Improved Productivity* and *Mechanical Vibrations: Modeling and Measurement*.

www.me.iastate.edu

This seminar counts towards the ME 600 seminar requirement for Mechanical Engineering graduate students.