

Remarks of David Dornfeld, March 21, 2012

Thank you, Senator Padilla and Senator Wolk for the opportunity to speak today on this timely topic of Advanced Manufacturing. My name is David Dornfeld and I am Professor of Manufacturing Engineering in the Mechanical Engineering Department of UC-Berkeley, Director of the Laboratory for Manufacturing and Sustainability (LMAS) and Chair of the Mechanical Engineering Department at UC Berkeley.

I have been working in the field of advanced manufacturing education and research for almost 35 years. I have also, since June, been helping to develop the roadmap for President Obama's Advanced Manufacturing Initiative and Partnership (AMP) as a co-lead of advanced technology development "workstream" or task force. There are 3 other complementary efforts addressing education & workforce development, shared infrastructure and public policy

The AMP was launched in January under the US Department of Commerce, with an initial steering committee including five universities and 11 US corporations. A final report of this committee will be submitted this April. Thereafter, a non-profit organization will be created to coordinate implementation of the AMP. The Obama Administration has included \$1 Billion of new, one, time funding in his FY13 budget, "to develop manufacturing technologies with broad applications."

It might be helpful to start my remarks with a definition of "advanced manufacturing" as currently used by federal government agencies. Advanced manufacturing involves the manufacture of conventional or novel products through processes that depend on the coordination of information, automation, computation, software, sensing, and networking, and /or make use of cutting edge materials and emerging scientific capabilities **which result in safer and cleaner products and processes, protecting human health, the environment, and unintended costs.** I have added the words in bold to the basic definition as manufacturing must be done in a sustainable context.

The AMP steering committee just met in Washington DC March 7th to review a final draft report of the four AMP taskforces. The committee is recommending a focused effort of identification and development of new technologies that will underpin a new era of American leadership in manufacturing. We need to be able to identify and prioritize breakthrough technologies and support the development of these technologies by a solidly formed manufacturing infrastructure. This will also require a deep, well-educated talent pool and policies that foster collaborative manufacturing research and product development.

Areas identified by the advanced technology taskforce (based on substantial surveying and discussion with industry, manufacturing associations, researchers, etc.) include, for example:

- Advancing sensing, measurement and process control (for process automation – discrete and continuous production, machinery, processes)
- Advancing Materials Design, synthesis and processing (includes nanomaterials, metals, coatings and ceramics, for example, lightweighting for transportation as high strength/weight ratio materials, high performance materials as for motors or batteries, new materials for special purposes in medical, electronic, defense, energy applications, additive manufacturing)
- Bio-manufacturing (production of bio-based products as well as use of bio-based technologies in production)
- Automation (process, system automation for handling, assembly, packaging, disassembly, etc.)
- Sustainable Manufacturing (efficient production with efficient use of materials, energy, other resources like water with minimal/no impact on the environment, including re-manufacturing)
- Nano-manufacturing (both nano-scale processes as well as nano-materials)
- Visualization, Informatics and Digital Manufacturing Technologies (“art to part” and a digital design to production pipeline)

One of the anticipated outcomes of the AMP will be funding for establishment of a number of Manufacturing Innovation Institutes (MII) in the US. The institutes will serve to bridge the gap between basic research performed in universities and national laboratories, and our production enterprises. These Institutes would serve as an anchor for technology development, education and workforce training.

What could California do in the area of advanced manufacturing? First, there is a tremendous amount of manufacturing, much of it advanced, already in California. But, to keep that manufacturing base and insure it grows here in California, and to accommodate future advanced manufacturing, we need to insure that we have a thriving set of policies, culture and eco-system connecting innovation to manufacturing. As a State, we need to enable the scalable manufacturing of products flowing from the creative designers, entrepreneurs, small and large businesses - in California.

California already is home to a number of national labs, leading universities, a strong educational pipeline in our community colleges and state universities, etc. that can form the basis of the advanced manufacturing technology development and growth in California. California also leads in efforts to insure energy and resource efficiency, environmental responsibility and diversity – all recognized as elements of corporate responsibility by leading California, US and international manufacturers.

But, we have some issues to confront as well. The back of my iPhone states “designed by Apple in California, assembled in China.” This is due to the lack of requisite production technology and components, and the cost of doing manufacturing, in California and the US. We are increasingly seeing “designed or invented in California and made in Kentucky”! It is this trend we need to address by pursuing a coordinated effort to insure that advanced

manufacturing thrives in California so that the people of California enjoy the benefits of a manufacturing workforce. This translates to higher rates of employment and increased tax base, among other benefits for our State.

Thank you.