Impact of technology on business

Technology

Modeling series-manufacturing Effective series-production demands that the market and production trends causing Hess problems, see Figure 2, can be successfully responded to. However, the maturity of AM-based systems is such that they are unable to do so. Hence, most of the problems listed in Figure 1 already occur. In series-production AM environments they would be more frequent and their effects more severe. The evidence indicates that not having the ability to provide solutions to these issues could have devastating economic consequences.

At an operational level this can result in serious loss in throughput and reduced customer service levels, higher cost, longer lead times, Rorer delivery reliability and the inability to undertake product design innovation, and enter new markets quickly and in the most cost-benefit direction. At a higher level permanent loss of customers and/or business failure can result and company growth can be seriously restricted if not halted for good.

A major business opportunity, therefore, exists to ensure that many companies can successfully establish cost, quality and delivery effective series-production systems and, therefore build and sustain higher levels of competitiveness in turbulent market conditions. The project will develop, build and validate a novel bead deposition nozzle technology that is able to change the shape and size of individual beads according to their function where functions include building surface features, building internal feature structures, ridge filling between layers and surface smoothing.

The efficiency of the bead nozzle will be optimized through development of CNN-control functionality that is able to control the positioning of each bead

and optimize the sequence with which beads are laid such that nozzle paths between deposition sites are optimized. The project will also develop autonomous planning software nationality for enabling effective planning responses in customized manufacturing environments.

The business opportunity will be addressed, therefore, by use of the BEAD tools to significantly improve the competence of AM processes such that the market trends and production practices shown in Figure 2 can be effectively dealt with. Here the project will address the main components of competent series- production within customized product and demand volume FED-based additive manufacturing environments by creating: 1 .

High & reliable quality levels - through enabling high levels of surface smoothness, feature definition and dimensional Lorraine conformance quality-based competences. 2. Predictable processing times - through reducing the high levels of process variability associated with the FED build process and removing finishing and machining post-build processes. 3. High level of delivery reliability - here predictable processing times and robust quality competences enable effective planning and schedule-adherence possible. . Affordable costs - through enabling (I) reductions in FED build costs resulting from use of optimized deposition paths and path velocities, (it) elimination of high labor cost finishing and machining operations, (iii) elimination of frequent change-over costs incurred through processing small batch sizes, (iv) elimination of capital equipment investment costs of post-build process equipment, (v) elimination of wasted production time and materials through reduced levels of inspection and defective components. . Shorter design-to-delivery lead times - through increased ability to respond

to disruptions with in the AM supply chain and hence maintain synchronization of material movement between series-production processes. 6. Higher levels of product design and manufacturing process mix & volume flexibility - wrought elimination of post-build finishing and machining processes and their lengthy changeover constraints.

Potential integration powwow outputs, for developing efficient FED series-production facilities, with commercial Enterprise Resource Planning (ERP) systems, which are the primary systems, used to design and plan manufacturing enterprises [2], will be examined and further funding sought if benefits can be gained. The widespread commercial penetration of ERP is evidenced by most large organizations worldwide having adopted it, and increasingly small- and medium sized enterprises (Seems) are now finding it cost effective and a competitive stickiest to follow suit.

The " 2011 Howlers Additive Manufacturing and AD Printing State of the Industry Annual Worldwide Progress Report" contains market research survey data collected from over 100 companies around the world who are involved in the provision of AM equipment and/or services. The report examined the growth in demand for AM systems and service providers since the technology was first introduced in to the market in the late sass's. Over the last two decades the overall AM market has continued to grow rapidly with worldwide revenues from AM systems and materials estimated at $651. Million in 2010, an increase of 22. % from the $530. 4 million produced in 2009. Here system sales and product upgrades were an estimated $385. 7 million of the total sales in 2010, an increase of 23. 4% from the $312. 6 million produced a year earlier. Within this market, see Figure 3. 1, the sales

from AD Printer technology represents 63% of the total market and sales of FED technology 66% of AD Printer sales. FED sales revenues represent by far the largest sales within the AM market. This is reflected in the number of FED units sold worldwide both cumulatively (1 5, 839 units, 37% of total sales) and in 2010 (2, 555 nits, 42% of total sales).

Forecasts for the AM market predict revenues growing from current levels to $5 billion by 2020 with FED technology making up -?$2 billion. Since AM technology serves a wide range of global industries, see Figure 3. 2, this level of growth rate could well be realistic. A clear exploitation route currently exists for the research outputs through provision as (I) standard features of new machine sales, which between forecasts predict will be between 2016 (when the tools become commercially available at the end of the project).

There are other AM methodologies hat also make use of bead deposition technology where suitable modifications to the nozzle technology would also make significant cost, quality and delivery benefits. Stand-alone software outputs from the project including the autonomous and intelligent systems application will be exploited as Add-in/Plug-in software utilities for stand-alone commercial CAD/CAM systems, discrete event simulation and ERP systems.

The strategy for dissemination of generic outputs from the project, to a wider audience, will be through publications in learned Journals, trade publications, cantonal and international conferences, and appropriate PEEPS, TTS and TTS-KIT networks. Further dissemination routes will be through consultancy

projects, industry based training for manufacturing and industrial engineers and through educational programs.

In particular, the DMS Advanced Manufacturing Processes and Mechanics Centre has a Masc. in Additive Manufacturing where dissemination activities can occur at regular periods during the 3-year project period and will continue after the program finishes. These dissemination activities and workshops will be used to engage manufacturing companies and to recruit their staff onto employer-engagement training programs, which require implementation of the project outputs. Public engagement activities will also be undertaken where appropriate.