ISSN: 2250-3676
[IJESAT] [International Journal of Engineering Science & Advanced Technology] Volume-7, Issue-2,166-169

A Research Framework on Planning for Advanced Manufacturing Technology

ChitalaGangadhar
Asst Professor,Department of Mechanical Engineering, Princeton College of Engineering and Technology,TS,India

Abstract

The research literature on ERP systems has exponentially grown in recent years. In a domain, where new concepts and techniques are constantly introduced, it is therefore, of interest to analyze the recent trends of this literature, which is only partially included in the research papers published. Therefore, we have chosen to primarily analyze the literature of the last 2 years (2003 and 2004), on the basis of a classification according to six categories: implementation of ERP; optimisation of ERP; management through ERP; the ERP software; ERP for supply chain management; case studies. This survey confirms that the research on ERP systems is still a growing field, but has reached some maturity. Different research communities address this area from various points of view. Among the research axes that are now active, we can, especially, notice a growing interest on the post-implementation phase of the projects, on the customization of ERP systems, on the sociological aspects of the implementation, on the interoperability of the ERP with other systems and on the return on investment of the implementations.

INTRODUCTION

There are clear indicators of a transformation in the production of goods that will usher in a new era of manufacturing. This new era derives from

• Scientific and technological developments that are pushing abilities to manipulate and consistently produce, especially at the molecular level

• Focused technological developments that enable sustainable manufacturing

This new era will draw upon and extend the revolution in microelectronics and the information technologies that employ them. Manufacturers will implement incipient abilities to consistently perform precise manipulation of materials at the molecular level, creating the emerging prospect of nanoscale manufacturing in which physics, chemistry, and biology converge. In addition, future technological developments will depend on a better understanding of fundamental biological processes and will apply these processes to a broad range of products beyond health. These developments are occurring in a highly connected and globalized marketplace where time to product and reduced production costs are crucial. Additionally, the sustainability of the production enterprise is becoming an explicit requirement for which new manufacturing approaches as well as improved information collection, analysis, and dissemination capabilities will be needed.

This paper reviews some of the main drivers, developments and future requirements in the field of micromanufacturing as related to the machining process from the perspective of the recent research and development literature. For the purposes of this paper micromachining includes creation of precise two and three dimensional workpieces with dimensions in the range of a few tens of nanometers to some few millimeters by cutting using defined geometry cutting tools. The review includes topics of process physics, including materials and microstructural effects, machine tools, tooling and sensing, workpiece and design issues, software and simulation tools, and other issues, e.g. surface and edge finish, and outlook for future developments

When the order is received, according to secondary OPP it must be checked how fast the order can be delivered immediately to the nearest factory. If the order exceeds the amount of available product in the secondary OPP, order providing from other factory will be discussed in terms of profitability, and of course, by considering transportation costs and make the necessary changes based on the OPP of the second factory; or the order will be provided from inventory of standard OPP

In proposed system, there are two categories in terms of order type: negotiable and non-negotiable. In the first type, the negotiation can take place in different parts of the product supply. For example, there may be a number of deliverable goods to the customer in the shortest time, which have a higher priority than product characteristics; therefore, after providing the percentage of the order, according to basic features and secondary OPP capabilities of nearest factory, discussing about the remained orders will be carried out. For better understanding the above procedure, we assume that from 100% of the orders, only 20% are delivered according to orders; In this case, the remained orders may be delivered in different ways; For example 30% of orders with different features may be delivered in 3 weeks, and the remained 50% should be produced from standard OPP and delivered in 6 weeks and if the orders has a greater priority, all of 80% unmet orders may take up to 9 weeks

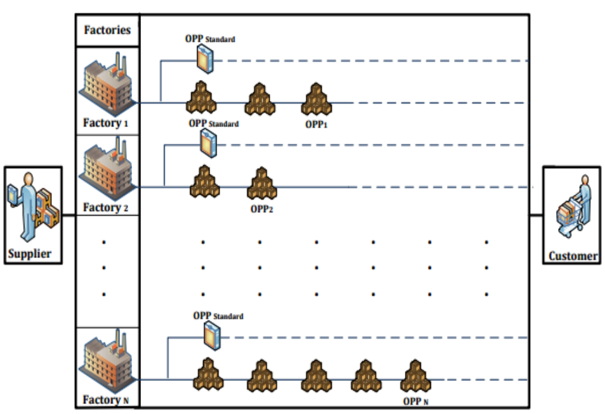

Fig. 1. Proposed production system with multi-OPP points

The main goal of the proposed model is providing customer orders completely in minimum possible time and with minimum possible cost. Investigated Costs in this paper include: Costs associated with the production, inventory holding costs at the warehouse, cost of transportation between factories and place of order delivery and cost of compliance changes.

We provided different parts for this article, that each of them provide different information about the organization of the used procedure .Section 2 presents the details of the MILP formulation for the production planning problem. Section 3 describes the implementation of temporal and spatial decomposition of the MILP problem in Section 2. In Section 4 we review some important theoretical concepts and in Section 5 we introduce a result where the dual gap of temporal decomposition is found to be at least as small as the dual gap for spatial decomposition. Sections 6 and 7 contain our novel approach for exploiting the economic interpretation of the Lagrange multipliers to reduce the search space for the optimal multipliers. Section 8 presents four numerical examples of increasing size and complexity for the multi-site multi-period planning problem, where the theoretical result is confirmed, and the economic interpretation of the multipliers is used to accelerate the convergence of numerical algorithms for solving the decomposed problem. Finally, Section 9 presents our conclusions and ideas for further research or applications.

The general approach that is considered for solving problem is a hierarchical approach. In the first stage, acceptance or rejection of orders will be determined according to factory capacity, cost and product price. In the second stage, mode of providing order for the accepted products will be investigated. Thus, negotiations may take place in the second stage. Generalizability of the proposed model makes it more practical and more comprehensible to managers.

Literature Review

Today Manufacturing enterprises use different production policies to enhance customer's needs satisfaction, such as Make-to-Stock (MTS), Make-to-Order (MTO), Assemble-to-Order (ATO) and Engineer-to-Order (ETO), each of which yields different advantages and disadvantages. Among these policies, MTS and MTO have been widely applied in the production planning. In MTS systems, finished good products are made and stocked upon forecast of the customer demands and customer's reception of products from a warehouse near to the customer. The main characteristics of MTS systems are high storage costs, short delivery time and low responsiveness to the customer orders (Soman et al. 2004). In contrast with MTS systems, MTO systems are conducted based on the customers' orders leading to lower storage costs, higher flexibility and longer delivery time are the major features of these systems (Olhager 2003). In this regard, many studies have been done in relation to the performance and control of these systems. In last decade, analysis of these systems has shown into some extent that appropriate combination of these two systems may balance the two above-mentioned systems to achieve better results.

As noted above, a production system which has recently attracted many studies attention is hybrid MTS-MTO which leads to major effects on responsiveness and competitiveness of the companies and it can exploit advantages of both MTS and MTO systems such as lower inventory (Kober and Heinecke 2012) and short delivery time (Olhager and Ostlund 1990). Also, studies by Atali and Ozer (2012) and Kaminsky and Kaya (2008) showed the cost of the new hybrid systems is significantly lower than the cost of either pure strategy. Although the MTS-MTO systems have a better performance in many cases, it faces limitations in operational decisions when system capacity is constrained or system has service constraints. Gupta and Benjaafar (2004) and Chang and Lu (2010) show the cost of the hybrid systems will decrease when the production constraints become more restrictive

In MTS-MTO production systems, for as much as a portion of the production system operates in MTS mode and the other portion operates in MTO mode, thus several items are produced to stock and others are produced to order. For these reasons, two questions are addressed about these systems, including (Hoekstra and Romme 1992; Gupta and Benjaafar 2004):

Which items should be stocked or made to order?
How must production capacity be allocated among MTO and MTS items?

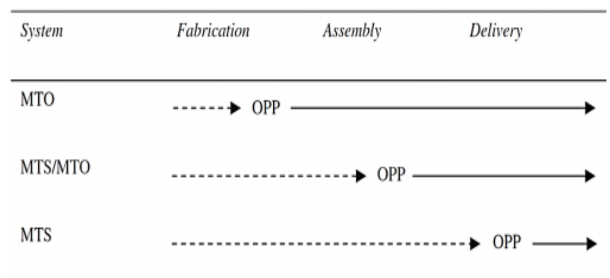

Fig. 2. Different production systems; dotted and solid lines represent forecast-driven and customer-order-driven activities, respectively (Rafiei and Rabbani 2012)

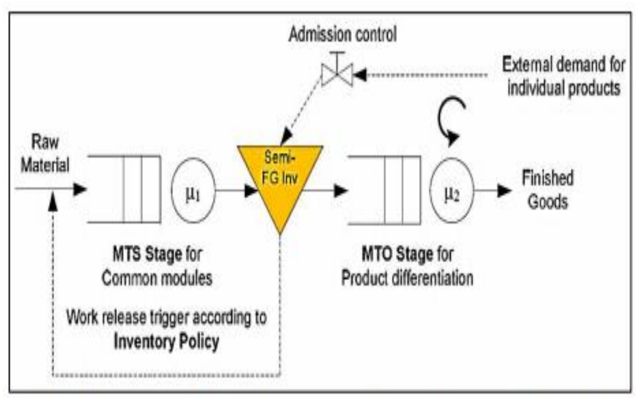

Fig. 3. A MTS-MTO system delivers finished products in two stages (Wang et al. 2011)

MTS-MTO systems by combining of pure MTS and pure MTO systems in a sequential manner, produce standard semi-finished modules and stock them as unfinished/semi-finished inventory in MTS stage (first step) and assign various finished products to orders according to specific requirements through customization in MTO stage (second step) (Rajagopalan 2002). In this

regard, it is noteworthy that the boundary between the two stages is called "decoupling point", which decouples the manufacturing of common semi-finished modules from the customization of finished products (Chang and Lu 2010). The concept of decoupling point specifies, where the customer's desired specifications influence the production value chain (Hoekstra and Romme 1992). As it is seen in Fig. 1, the place of decoupling point is specified in different places along the production systems in MTS, MTO and MTS-MTO.

Conclusion and Future Research Directions

In this paper, a multi-product multi-period model with consideration of multi-site production is presented. Connections between production sites are established through the transferring inventory of semi-finished products and inventory of raw materials among themselves. Two different approaches for solving the model are proposed. The main goal of the first approach minimizes the labor costs and of the second minimizes the holding costs. Also, for solving proposed model of this paper, Random Production Strategy Algorithm has been developed. Table 1 results, show if the ratio of labor costs to holding costs be in the same level, both of these approaches and hybrid approach will provide the same answers. But if the ratio of labor costs to holding costs be a considerable value, provided answers by different approaches will differ and the higher ratio values lead to greater differences in answer. Meanwhile, the hybrid approach has shown good performance and provided the best answer among others. As previously mentioned, the proposed algorithm in this paper is heuristic. In the future, metaheuristic algorithms can be used to solve the model and obtained results can be compared with the results of the RPSA.

References

[1] Adan, I.J.B.F., & Van der Wal, J. (1998). Combining make to order and make to stock. OR Spektrum, 20(2), 73- 81.http://dx.doi.org/10.1007/BF01539854

[2] Arreola-Risa, A., &DeCroix, G.A. (1998). Make-to-order versus make-to-stock in a production-inventory system with general production times. IIE Transactions , 30(8),705-713. http: // dx .doi.org /10.1080 /0740 81 79 80 89 66516 Atali, A., &Ozer, O. (2012).

[3] Stochastic Multi-Item inventory system with Markov-Modulated demands and production quantity requirements. Probability in the Engineering and Informational Sciences (PEIS), 26,

[4] Chang, K.H., &Shu Lu, Y. (2010). Queueing analysis on a single-station make-to-stock/make-toorde r I nven tory -production system. Applied Mathematical Modelling, 34, 978-991.http://dx.doi.org/10.1016/j

[5] Chang, S.H. et al. (2003). Heuristic PAC model for hybrid MTO and MTS production environment. International Journal of Production Economics, 85(3), 347-358. http://dx.doi.org/10.1016/S0925-

[6] Federgruen, A., &Katalan, Z. (1999). The Impact of adding a Make-to0Order item to a Make-to-Stock production system.Manadement Science, 45(7). http://dx.doi.org/10.1287/mnsc.45.7.980

[7] Georgios, K.M., &Puigjaner, L. (2009). Multi-site Scheduling/Batching and Production Planning for Batch Process Industries. 10th IntSymp Process Syst Eng.-PSE2009, R.M. de BritoAlves, C.A.O. do Nascimento and E.C. Biscaia Jr. (Eds.).

[8] Gnoni, M.G., Iavagnilio, R., Mossa, G., Mummolo, G., &Leva, A.D. (2003). Production planning of a multi–site manufacturing system by hybrid modeling: A case study from the automotive industry. Int J Prod Econ, 85, 251-262. http://dx.doi.org/10.1016/S0925-5273(03)00113-0