APPLICATION OF MODULAR LIGHT WORKPLACE DESIGN IN AVIONIC EQUIPMENT MAINTENANCE AND REPAIR SERVICES

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The contribution is devoted to issue of modernizing and building new highly flexible, customer-oriented production sites and production clusters based on application of shaped modular systems as essential elements for designing technological and auxiliary departments in engineering production. 

Key words: workplace, modular design

1 INTRODUCTION

Customers constantly come up with new requirements. If we want their individual needs to be fulfilled, we have to continually monitor development and view customer opinions and suggestions so that optimal solution was found, which contributes to their maximal satisfaction. Innovations have become an essential element of global economy and especially are concern of company.

Its innovation capacity is an important factor for adaptation to rapid changes and strengthening of competitiveness. The driving forces of innovations are businesses, under pressure of globalization and open competition. They have purpose only if their creators can efficiently and effectively evaluate their commercial success and are successfully implemented into reality of company life, rather than competition can implement them. Dynamics, variability and flexibility hand in hand with the knowledge services (Knowledge Intensive Business Services) must to be now key business activities. Application of structurally dynamic, reconfigurable technological, service and integration modular systems and components in production is therefore for this effort only a benefit.

2 NEW APPROACH IN BUILDING PRODUCTION DISPOSITION

For current development strategy of engineering production is critical orientation onto customer requests. These requirements relate to new features, products, environment, education, humanization of life, production culture etc. Their fulfilling creates pressure to shorten innovation cycles in development and manufacture.

Mass-produced products cease to be attractive regarding individualized and rapidly changing customer requirements. A principle to prepare right product at right quality at right time and right place applies. Competitiveness is associated with use of new types of products and their functions, new materials, new technologies, but also information and knowledge.

Strategy to achieve competitiveness requires flexible production. Required are:

- quickly adapt to the new product
- quickly meet customer
- high quality,
- reasonable price.

Requirements that are currently imposed on modern engineering, focusing on eco-innovation, high productivity and flexibility in small quantities of produced sortiment, continuous shortening of production time, increasing time and machine utilization power quality improvement of processes and products, reducing warehouse and inventory material to minimize production costs and more, are well known.

Today, at global downturn in machinery production, what market is „flooded“ with low-cost products from Asian countries is one of the dominant requirements and a critical success factor of future of the company is except constantly improving function of products, ability to dynamically respond to customer requirements and transform those requests into properties of future products in very short time. Meeting the requirement to reduce overall production cycle, from its design through delivery to the customer with the lowest possible cost of production, is the most important prerequisite for success business.

3 RECONFIGURABLE MODULAR SYSTEMS

Engineering applications of modular production systems in developing clusters allows user in particular:

- very fast time reconfigurability of system onto new generation needs
- economic adaptation to customer requirements in terms of volumes, terms and product characteristics,
- quick and easy stabilization of new production conditions flow,
- maintain optimal production costs,
- recognition and operative capacity to cope irregularities,
- support management of production-oriented material flow.

Elements and components of modular system built from profiles allow easy development f custom workstations, assembly and disassembly workstations, shelving, conveyor systems etc. They allow engineers and
designers to create new, custom solutions manufacturing reports, expand, add and modify existing ones.

Thanks to modifiability of design elements elimination of potential design errors and deficiencies is allowed. Their application in production allows the application of lean manufacturing principles, which can be implemented at any stage of construction or operation of such a production system. Among materials used in construction of modular elements are dominant materials based on aluminum and PVC materials. They are produced in wide range of profile modules, various sections, shapes, dedicated guide grooves with sophisticated fasteners and addressed below. Therefore, the application of metallic materials is smaller. Produced elements and components can be classified as:

- basic construction (beams, ducts, etc.),
- connectors (couplings, etc.),
- design and ergonomic (plugs, caps, bushings, etc.),
- energy (electric divorces, pressed air, etc.),
- motion (joints, shoulders, rotating, etc.),
- technology (providing technological operations),
- manipulation (providing transportation and handling).

It allows almost unlimited number of proposals. Elements are connected by screw connections for easy reuse. Produced connections are highly stable, reliable and require no maintenance. Workstations are built quickly and cheaply, and can be easily adapted to specific needs of production.

### 4 WORKPLACE BASED ON MODULAR SYSTEMS

Benefits from their application in construction of production structures are undeniable. Apart from already mentioned direct economic and market (flexibility, high modifiability a wide variety of layout and functional combinations, etc.) have also other, e.g. modern design influencing company culture changes, ability of ergonomic reconfigurability and more.

In general, basic modular unit of modular workstation is working desk. Its application area ensures high structural extensions, which may consist of professional module (profimodul - special tools, jigs, measuring devices) and power connections and components module (electrical outlet air connections).

Workplaces can be purposefully linked to higher production clusters with structure, that derives from their destination, degree of technical equipment, and modification level of mutual compatibility. This allows application of funds enhancing production quality, optimal use of material and energy flows, production facilities etc. (Fig. 1,2).

It is necessary to say, that some producers of elements for modular workplace design offer to designers of these workplaces CAD models of their elements so for designer it is easy to download needed element and create CAD model of desired workplace. Such CAD model allows easy to evaluate designed workplace and make changes and again evaluate. By using of this CAD model new workplace can be designed very quickly and it helps to achieve short time until workplace will be realized. All workplaces shown at figure 1 and 2 were created by using CAD models downloaded from producers’ web pages. Also if are used these models there is minimized probability of errors in workplace design. It reduce costs for building workplace.
As it is possible to see in Figures 1 and 2, workplaces designed on modular basis can be very various and can serve to many purposes. In avionic industry it is possible to adapt workplace to nearly any desired maintenance and service tasks. It is important for tasks which are not repeated frequently because it is not necessary to buy new workplace, but if exist such modular workplace it is possible to adapt it for new tasks, and it can be done in short time with low costs.

5 CONCLUSION

Surviving the crisis means on market side requires responsiveness to customers and focus on customer requirements. On the company side analysis and correction of own non-productive consumption of all components of company organizational structure and optimum level of profits.

The concept of production systems, companies are projected as next-generation systems. They present complex integrated solutions with latest application software, information and communication technologies and intelligent manufacturing systems together in new decentralized and adaptable production and organizational structures.

The aim of such solutions is increasing productivity without losing flexibility, cutting production time, improving quality, increasing products and services value etc. They are modified as ecological and socio-economic systems and therefore are difficult to design, implementation and operation. Their development is a subject of numerous literature.

BIBLIOGRAPHY


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