



Furniture production-Mechanisation and Work Procedure Layouts

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Abstract

The present paper stresses the need for the incorporation of mechanisation and associated workshop essentials to improve qualitative and quantitative output of furniture products and associated components. There is now a demand for globalised technological frameworks for developing countries too who are poorly organised and lack research and development inputs with respect to their main materials and products.

Keywords: Mechanisation, workshop, wooden furniture, wood products, furniture industry.

Introduction

The distribution of furniture industries in India is not localised, but it is ill-equipped, and lacks proper machinery and skilled manpower. Precious and comfortable wooden chairs and other furniture has been replaced by easy to make and easy to handle steel furniture. The extravagant beauty and uniqueness of wooden furniture seems to be missing from schools, offices, homes, etc., but for the construction and joinery industry, the importance of wood still remains.

About five decades ago wooden turnery articles such as legs, arms, backs, bobbins, beads, table lamps etc. was a common site in every household. In such a situation huge employment potential existed for the lower strata of woodworkers. The output of a manual mechanised lathe used to have been the source of lively hood for many families.

Now timber in solid form has become a rare commodity and the panel industry has grown significantly and progress in their diverse area is due to emergence of plantation species like eucalyptus and poplar and agro base. This paragraph needs rewriting as I do not understand what you are trying to say.

Still lot of wood is produced in the form of small dimension timber branches, small twig logs, roots and stumps and there is ample scope for employment generation and value added quality furniture in diverse range of designs. Mechanisation and improved work procedures and layouts can be incorporated into flow lines to achieve reliability.

The benefits of mechanisation against hand tools are outlined below: Increased output of quality product. Less fatigue to the operator, machinist and co-workers. Encourages the operators to work while the machine is in motion, (running). The taker-off is fully occupied in the work and concentration towards work is full. Continuous feeding of material ensures quality replicates of identical dimension. Safer to operate as hands are at sufficient

distance from the cutting edges. Less experienced operators can also run the machine once machine is set. This aspect can trigger a hidden mechanism of self-learning and so trained manpower is generated within the unit avoiding extensive training. Short term training in such cases is sufficient to certify the competence of the operator. Mechanisation is desirable for dangerous operations, Ergonomics is improved because of appropriate working posture and workshop hygiene. Machined surfaces are better suited to subsequent finishing treatments due to absence of fuzz, deep cuts, and poor surfaces that are frequent in the case of hand tools. Certain jigs and fixtures could be incorporated to work with different diameters, width and species of bamboo. The manual operational variations are eliminated as machines do not accept them, Sequential layout based flow lines are possible which makes the all processes faster. Hand tools seldom contribute towards chips and dust removal from worked surfaces. Whereas mechanised tools and machines take care of this aspect and chip and dust are drawn out in a proper way from the cutting process. Species wise tool machine interaction, segregation of material as outer-middle-core, or from root to top variations can very well be evaluated and "grading" of output is possible. R and D within the species and between the species will go a long way towards end uses and product development.

At this crucial juncture, furniture making can be solid wood based (low output) or panel based (large output) or a blend of both beside upholstery (large output). In such a case lower output based units will suit the lower strata well for and others may operate on large scale. Regardless of the above, the work procedure and layout will have to be based on sound principles, some of which are stated hereby.

Plant and Shop Layout: Layout can be described as a schematic arrangement of systematic and organised setup of the various departments and the various equipments that are to be used, for efficient and effective use¹. As a general the following type of layouts exist in diverse fields². i. Fixed Point Layout. ii.

Functional or Process Layout. iii. Byproduct Layout.

Preliminary layout of a furniture industry for an entrepreneur will comprise the following components only in the initial stage: i. Cross Cut Saw ii. Universal Wood Working Machine iii. Planer iv. Thicknesser v. Tenoner vi. Mortiser vii. Turning Lathe.

The material in such a case will be seasoned small dimension stock (figure-1).

The salient feature of such a simplified layout of furniture industry are: Machine 2 is capable of doing all preparatory operations on the small dimension stock in conjunction with Line saw (machine1). The prime operation of planing and thickening is done by diagonally placed machines 3 and 4. The turning lathe is placed along the wall on the right hand side and the operators occupy the wall side space to ensure safety

and flow of material. Tenoner and mortiser, machines 5 and 6, occupy the wall on the left hand side ensuring ease of use and safety for the operators. The central line mid-space of the workshop hall is kept open to facilitate the movement of material as well as to install machines of improved output once the business starts expanding and the entrepreneurship based layout becomes more effective incorporating other aspects such as material flow besides other added features. The flow of material (operators) can be straight, u-shaped, ring shaped or odd angle in production lines³. In the present layout the flow between machines 1, 2, 3, 4 will be considered straight and becoming odd angle at stage 7 machines and also for 5 and 6 placed along the walls.

Machine operation chart: In modern furniture making units nothing is left to operator's choice leading to uncertainty and each product operation gets channelized as given for a chair frame:

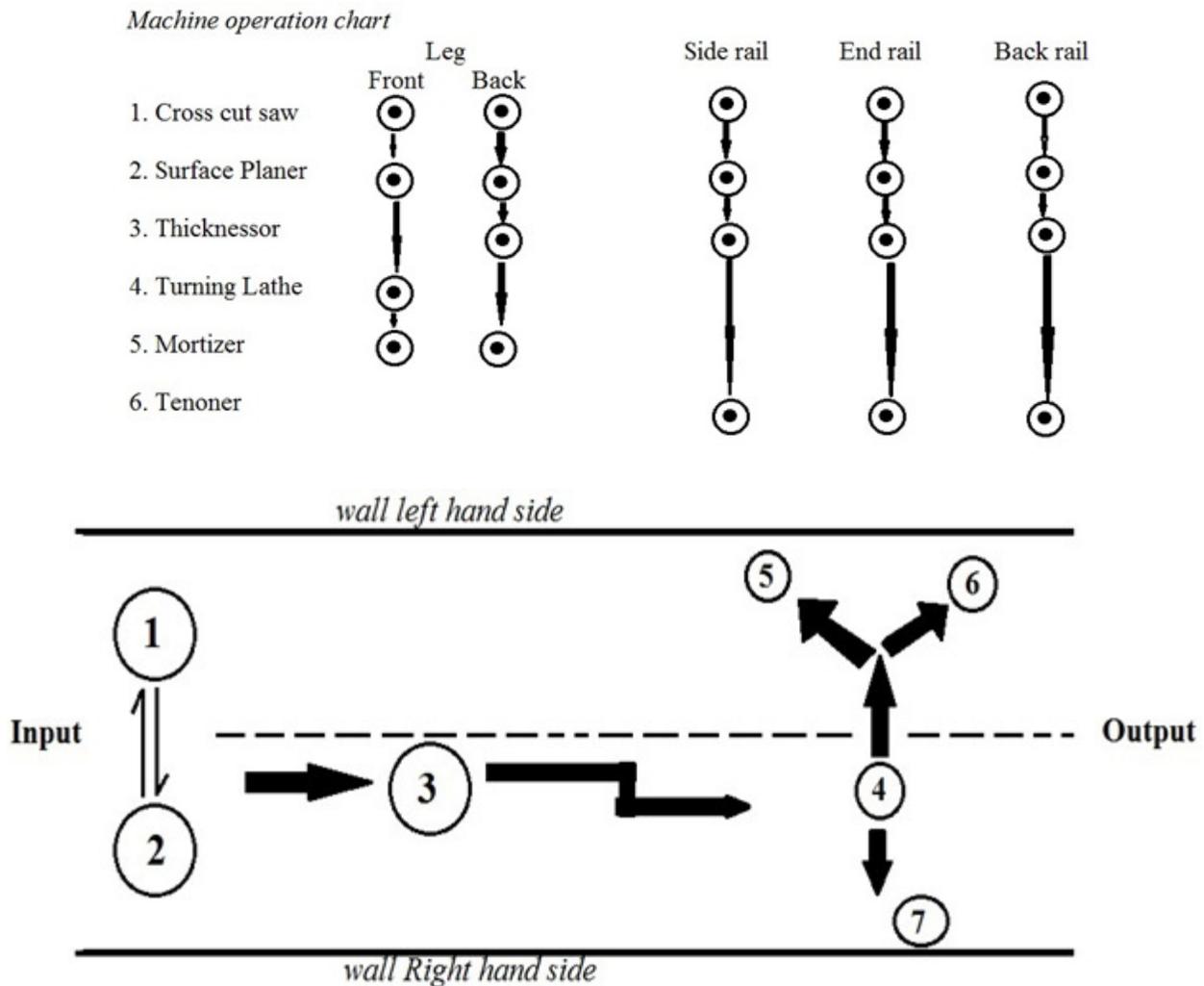


Figure-1
 Simplified layout of furniture Industry

To sum up the spread sheets for a product from beginning to finished product will be quite comprehensive and well defined, based on executive level decision making and improve quality of product and keeping in view the ‘trends’ as well.

Technical criteria of wood working machines: This factor is of chief importance when it comes to the manufacturing of the various wood working machines. The relative tolerances, operative mechanisms, feed speeds show large variations within specified ranges. The machine should have production chart and should be easy to learn and should come with DO’s and DON’T instruction sheets. A good CFC (common facility centre) should have accurate machines and should be able to provide trouble-free service. The following example also highlights the influence of material on joint performance in the product especially a chair which is subjected to many forces and bending moments during use. Lower and upper limits of mortise and tenon dimensions (Nominal dimension of joint is 8mm)⁴.

Hardness of wood	Boring or mortise (mm)	Dowel or Tenon (mm)
Soft (Pine, Spruce)	+0.05 -0.00	+0.3 +0.2
Semi hard (Birch, Beech)	+0.05 -0.00	+0.2 +0.1
Hard (Oak, Teak)	+0.05 -0.00	+0.1 +0.0
Very Hard (rosewood, Wenge)	+0.05 -0.00	+0.0 -0.1

Apart from technical criteria reliability and efficiency of a machine is another component to ensure long time rehabilitee is another and ensure preventive maintenance and is expressed as below:

$$\text{Efficiency \%} = \frac{T}{F + T} * 100$$

Where T is defined as average time interval between break downs, F is average duration of breakdown and R/D work is in progress to improve the trouble free service.

Special features of furniture industry: The furniture industry in developed countries is well-established, yet is considered as a low profit and less market increment^{5,6}. The industry is scattered? In various countries with biggest firms in the small to medium economy countries. The industry is considered as supplier-dominated⁷ and non- innovative. Furniture or wood industries have less Rand D expenditure and the absence of patent protection are a major drawback of furniture or wood industry. In such a situation widespread imitation of successful designs becomes a major problem affecting profits. Therefore, despite strong competition, some European countries like Italy and Germany are among the leading furniture and wood products manufacturers and exporters to the world due to their excellent marketing, designing, and product innovation⁸.

Conclusion

Considerable advancements in “approaches” are taking place in mass production of diverse ranges of utility items and furniture is also such a product with numerous designs and shapes and types using diverse ranges of materials. An attempt has been made here to study wooden furniture and its global status with regard to upgrading of technologies. Mechanisation if not automation is the principle component which is lacking in this part of the developing world. A brief overview of this aspect in particular and others in general has been presented in this paper. A simplified layout example, characteristic in furniture industry has been demonstrated with a brief overview of furniture industry and layout models that were surveyed besides highlighting the benefits and importance of mechanisation.

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