



OPTIMIZATION OF PLATE CUTTING LAYOUT TO MINIMIZE OFFCUT - SCRAP USING EXPERTISE APPROACH

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ABSTRACT

In the past few years there has been tremendous research in the field of fabrication & machining with developing technology. With increased competition in market & to achieve high profits it becomes necessary to utilize new innovative technology for improvised production. In this report the detailed analysis of plate issue has been done in context for optimization of plate cutting & minimization of offcut/scrap generated. In order to attain the optimum results, a new plate cutting layout is proposed & offcut storage yard is designed. The plates used for experimentation was of E250/E350 Grade widely used in fabrication. Nesting was done through SAPS Software & plate cutting layout was prepared for plain cutting. The confirmation of plate cutting layout was done after reduction of offcut from the plates. A plan was prepared for material flow Experimental figures & sheets are provided to confirm the effectiveness of this approach. After confirmation the plates flow started in accordance with plate cutting layout avoiding offcut generation.

Keywords: Offcut, Scrap, Nesting, Plate, Optimization

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1. INTRODUCTION

A manufacturing company should make use of raw materials effectively. Planning must be done for utilization of this material leaving an end impact on customer service. In make-to-order industry material plans affects the cost reduction, speed of production, accuracy & firm's ability of securing contracts. This journal focuses on the firm's ability to purchase raw materials, generating plans, dividing it & subsequently process it. It shows the problems arising due to ineffective way of cutting stock of plates piling to the generation of offcut-scrap.

2. OBJECTIVE

- Minimize Offcut-Scrap by Design of Plate Cutting Layout
- Receiving of plates from steel yard following plate cutting layout
- Maintain uncertainty of Offcut-Scrap if any generated in SAP/Register
- Ensure offcut check prior to new production order
- Ensure Continuous Improvement

3. SUMMARY OF PLATE CUTTING PLAN

In the steel industry preparing & ordering raw material is critical process. The raw material accounts for 35% to 40% of the total cost. Raw material is ordered in bulk for volume discounts & to avoid extra costs applied to small orders. After the raw material has arrived, a critical design process generates the “plate cutting plan” which specifies the details of the order & how the production operations will use the plates to fabricate a product.

3.1-Nesting:It is the process of creating layout of materials to minimize scrap generated mostly during oxy-fuel – plasma arc cutting process of complex profiles using mild steel/stainless steels in a manufacturing industry. The irregular parts are created using SAPS software directly using CAD sheets. IGES & DXF formats can also be fetched directly into SAPS.



Fig- 3.1 Plate Cutting by CNC

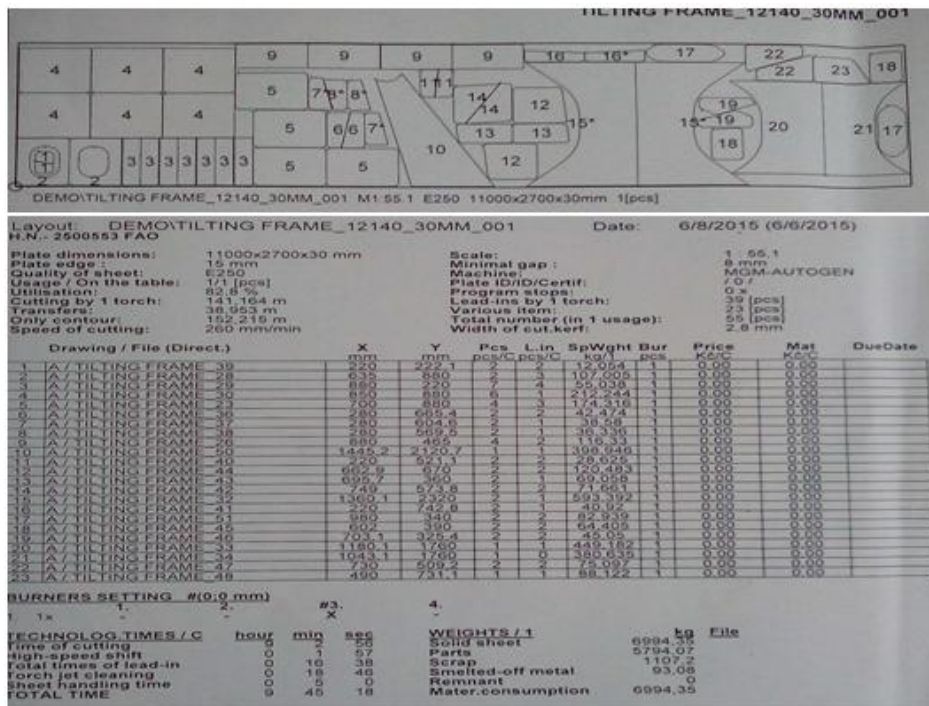


Fig- 3.1.1 Nesting sheet

3.2- Need for Implementation of Plate Cutting Layout:Plate Cutting Layout is an important process in the detailed design phase, providing information regarding all aspects of operation as marketing,

pricing, cost, production, material ordering & offcut generation. Necessity of generating a plate cutting layout is important so as to avoid offcut generation. As the material cost make up most of the project

cost & financial benefits, improving of plate cutting process leads to significant financial benefits & competitive advantage.

However, cost is not minimized simply by minimizing offcut. As the unit cost of raw material varies with width of plate to be ordered, so offcut generated directly affects the unit cost, as the price of offcut plate decreases in compare to that of the uncut plate contrary to offcut, scrap does not have that much effect on material cost as scrap generated is very less & its utilized wholly. This systematic approach makes the engineers to use their experience to solve the problem of offcut-scrap generation from custom-order size plates. This focuses on speed up production, reduced offcut inventory.

4. CLASSIFICATION OF MATERIAL

4.1. Offcut: For any thickness of plate upto or more than 500mm × 500mm to be considered as offcut.



Fig4.1 plate's offcut

4.2. Scrap: For any thickness of plate less than 500mm × 500mm to be considered as scrap.



Fig- 4.2 Offcut Scattered in Yard

4. DESIGN OF LAYOUT

4.1- Existing layout: After brainstorming with Engineers & Observation, data collection was done which is shown in the flowchart below depicts the offcut generation.

The flowchart (Fig-5.2) shows the outcome of MS plate as a series of offcut & scrap generation being dumped in yard without proper record resulting in wastage of offcut – scrap left unused. This results in high cost of incoming projects as the dumped material was not properly utilized. The problem was rectified as loss occurring & modification was done shown as such new plate cutting layout was approved.

4.2- New Model of Plate Cutting Layout & Offcut Storage: New Plate Cutting Layout was approved & successfully implemented, which showed reduction in offcut generation. Although scrap was generated as part of CNC cutting due to smelt of material which accounted for very less wastage of material.

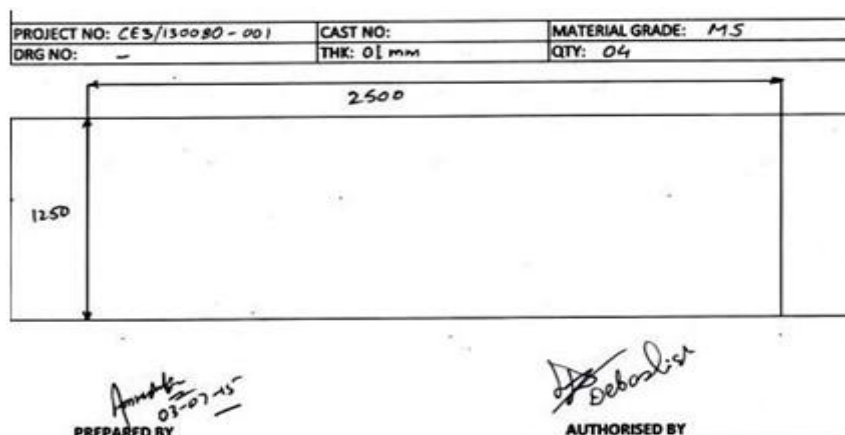


Fig-5.1 Approved plate cutting layout

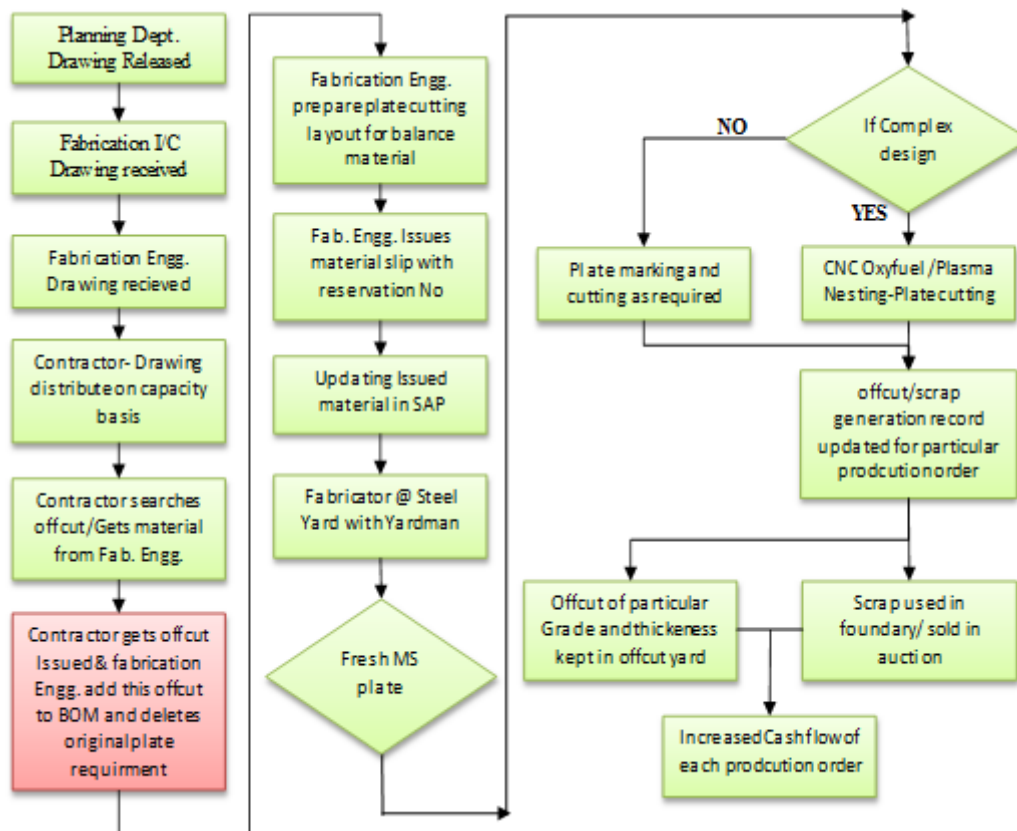


Fig-5.2 Flowchart for new model of plate issue

5. CONCLUSION

Under Plate cutting layout Scheme, the benefits include avoiding offcut-scrap generation, reduction in financial losses, plate optimization. It involves the implementation of plate cutting layout in many other manufacturing units' benefits to Clients and Contractors. The cost of waste is usually built into project tenders and therefore clients end up paying for material wastage. By reducing the total volume of waste generated, a reduced cost for the project can be achieved. This cost saving may be shared by main contractors, subcontractors and clients. This happens in partnering arrangements and it could be introduced in other forms of procurement as well.

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