

# Application of Technical Consulting into the Engineering Design in Foundry Projects

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**Abstract:** The engineering design plays a crucial role in ensuring efficient and safe production of castings in a foundry project. Engineering design generally includes factory layout, production equipment, material logistics and storage, safety and environmental consideration, quality control and inspection, utilities and services, and environmental sustainability. Technical consulting is widely applied during casting production. It involves providing expertise and guidance to individuals or organizations in the casting industry. Technical consulting covers a wide range of topics, which are related to casting processes, materials, equipment, quality control, technology application and overall foundry operations. Technical consulting also offers many benefits when applied during the engineering design of foundries. In this paper, the necessity of technical consulting during the foundry design is analyzed, and the related benefits and extra value are presented. By providing specialized expertise and guidance to individuals or organizations, the aspects of implementing technical consulting in engineering design will include: facility layout and planning, equipment selection, environmental and safety compliance, energy efficiency, material handling systems, quality control and inspection facilities, waste management, training programs, technology integration, cost analysis, and environmental sustainability.

**Keywords:** engineering design; technical consulting; project management; technology application

## 1 Introduction

Engineering design is crucial in running a successful foundry project. Engineering design has significant influences on the foundry efficiency, casting quality, and cost-effectiveness of process and production. Effective engineering design ensures that the casting production can be maximally optimized for the casting function and performance. State-of-the-art design will minimize the material wastage, and contribute to environmental sustainability. The proper engineering design also minimizes the casting defects, and ensures higher quality and reliability of castings. Meanwhile, the efficient design ensures proper manufacturing, which reduces the production time and required energy consumption. As a result, the cost of castings is reduced, and the competitiveness of the company is increased. The

engineering design generally includes factory layout, production equipment, material logistics and storage, safety and environmental consideration, quality control and inspection, Utilities and services, and environmental sustainability. Concept engineering design is seen as the first phase of design for a new foundry project. The concept design involves developing a preliminary plan that outlines the key elements and features of the foundry facility.

Technical consulting generally provides expert guidance and assistance to the operation and management of foundries. By offering extra value, it helps optimize processes, improve efficiency, enhance quality, ensure safety, and address specific challenges. Technical consulting for foundries focuses on many topics, like process optimization, material selection, scrap reduction and quality improvement, equipment evaluation and upgrade, safety and environmental compliance, energy efficiency, quality control and inspection, waste reduction and recycling, worker training and skill development, troubleshooting and problem resolution, cost analysis and financial planning, technology integration, market and industry analysis. Technical consultants need to have expertise or knowledge in metallurgy, materials science, mechanical engineering, operation and management processes.

## 2 Result and discussion

### 2.1 Engineering design and technical consulting

Engineering design is a complex and interdisciplinary process that requires expertise in metallurgy, materials science, mechanical and civil engineering, industrial design, and project management. Collaboration with experienced engineers and specialists is essential to create a successful design that meets production goals while adhering to safety and environmental standards. For an engineering design, technical consulting is highly beneficial in a foundry project. Engineering design for a foundry project involves the creation of detailed plans, specifications, and layouts for the establishment of a foundry facility or the improvement and expansion of an existing one. Technical consultants bring extensive knowledge and experience in engineering, metallurgy, materials science, and foundry operation. They can provide insights and solutions that may not be readily available within the client's organization. Consultants can

also assess the proposed design and suggest improvements to optimize processes, reduce waste, and increase overall efficiency. Their expertise generally leads to cost savings and higher productivity. Consultants help implement quality control measures and inspection processes to ensure that castings meet the required standards and specifications. This minimizes the risk of defects and rejects.

Foundries must adhere to various safety, environmental, and regulatory standards. Technical consultants can assist in designing facilities and processes that comply with these regulations, reducing the risk of fines and legal issues. Consultants can recommend the most suitable equipment for the project, considering factors such as capacity, energy efficiency, and automation. They can also ensure that the selected equipment is integrated into the facility effectively. Consultants can help identify potential safety hazards within the design and develop safety protocols and systems to mitigate risks, protect workers and prevent accidents. Consultants can advise on energy-efficient practices and technologies, helping to reduce operational costs and environmental impact. In the event of issues or challenges during the construction or operation of the foundry, consultants can provide rapid and effective solutions, minimizing downtime and production unsafety.

In general, technical consulting for engineering design is seen to be essential in a foundry project, to ensure the successful planning, construction, and operation of the facility. The goal of engineering design in a foundry is generally to ensure the efficient and safe production of cast metal components while optimizing resources and meeting quality standards. Technical consulting offers related foundry expertise, quality assurance, compliance, cost-effectiveness, and risk mitigation to the project, ultimately contributing to its overall success.

## **2.2 Principles of technical consulting for an engineering design**

When implementing technical consulting during the engineering design phase, certain principles can enhance the effectiveness of the consulting process and contribute to the success of the engineering project. The key principles include:

- To involve technical consultants early in the engineering design phase to benefit from their expertise during critical decision-making stages. Early engagement helps in identifying potential challenges, aligning strategies, and ensuring a more integrated approach to the design process.

- To ensure that technical consultants possess deep domain knowledge relevant to the specific engineering project. Expertise in the relevant technology, standards, and the best practices is essential for providing valuable insights and recommendations.

- To conduct collaborative design workshops involving both the engineering team and technical consultants. Ideas can be exchanged efficiently, and design challenges can be addressed collectively.

- To ensure that the engineering design follows relevant standards and regulations. Technical consultants should provide guidance on compliance, ensuring that the design meets all requirements.

- To conduct a thorough assessment of available technologies that can enhance the engineering design process. The innovative technologies are evaluated and adopted to improve efficiency and performance.

- To identify potential risks associated with the engineering design. Technical consultants contribute to risk analysis and propose strategies to address potential challenges.

- To Propose solutions with potential future expansions or changes in requirements. Technical consultants can guide the engineering team in making choices that align with long-term business goals.

- To conduct thorough cost-benefit analyses for different design options. Technical consultants can contribute by evaluating the feasibility analysis of various design choices and recommending cost-effective solutions.

The principles of implementing technical consulting during the whole process of engineering design have to be detailed in the different steps, demand evaluation, technology and process selection, facility layout, equipment selection, material logistics, environmental evaluation, safety, energy efficiency, quality control and inspection, cost analysis, and project management.

## **3 Conclusion**

Application of technical consulting should be considered at the early stage of engineering design as much as possible. Our experiences show that it will add many benefits to the foundry project, particularly when introducing new products or updating the old production facilities. The potential risks are identified and the corrections are given. All processes are monitored or conducted by consultants during the engineering phase. By integrating the above principles, technical consulting can ultimately contribute to the successful realization of the foundry project.