Study on Compatibility of Lean Management in Hydropower Enterprises

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Abstract. The article aims at providing an effective guidance for the production of power generation enterprises to take an intensive road. Beginning from presenting the ideological differences of lean management and the traditional production management, combined with the characteristics of the electric power production in hydropower enterprises, it analyzed the compatibility of lean management in hydropower enterprise management. At last, the article believes lean management applies in hydropower management system.

Introduction

Lean thinking defines production value of enterprises according to user demands, which organize all production activities according to value flow, retain value-creating activities and make it flow. User demand pull production, rather than push products hard to the user, exposed the hidden muda in value stream, continuous improve to reach the acme of perfection. Lean management was applied in the field of production successfully. They have a new business model to manage the business, come to the fore and become the new benchmark for the industry. In the capital and technology intensive industry, application of lean management is relatively little. Since the electric power system reform in china, the government still controlled the electricity price, but internet power competition has appeared between power generation companies and the situation is increasingly fierce. In this case, the benefits of power generation enterprises seriously declined, regional large losses have been formed, and "small profit era" is coming. In order to reduce the cost and improve competition, power generation enterprises should gradually transition to a market-oriented and improve management efficiency. Thus, it is particularly important to find a suitable power production mode. Lean management is the best choice.

Differences between Lean Management and Traditional Production Management

The core of lean thinking is to create as much value as possible with the minimum input of resources, provide timely products and services to customers. Lean management includes five principles: Value, from the customer’s needs, realizes the value of the process by satisfying customer needs; Value stream, review all process steps from the order to the collection of payment, whether it has value; Flow, process steps can be like a river, no pause, organic work; Pull, flow of power from the customer demand, which is demand pull; Perfect, continuous improvement, the pursuit of perfection. The difference of lean management and the traditional production management includes the following five aspects:

Inventory Management

Inventory is the lubricant in the traditional production management point. A certain amount of inventory can guarantee continuity of production, avoiding production interruption. Lean Management believes the stock is the source of corporate waste: First stocks take enterprise fund and increase the cost of capital; second, workers can easy repair if the unqualified products on production line, so the existence of the inventory will relax the pursuit of "zero return zero repair".

Economic Production Quantity and Small Batch Production

Traditional production management advocates "economic production quantity", namely the preparatory cost decreased with increasing batch. To weigh each batch of product pre-production,
when the preparatory cost and the average annual cost of storage is the sum of minimum, get "economic production quantity". Lean management advocates "small batch production", namely enterprise is committed to reducing the time and cost of each adjustment. When the batch is ready to reduce, the cost is reduced. Follow the principle of rapid adjustment and small batch production, so as to keep a lower inventory level.

**Push and Pull Production**

Traditional production management emphasizes "push" production: according to the budget and schedule production prepare the raw material from upstream to downstream, which highlight the concept of a "push". Lean management is a reverse thinking, emphasizing the "pull" production: production formulated according to the customer demand, production schedule and material arrangement is pulled from downstream to upstream.

**Cost and Quality**

The traditional production management believes that cost and quality is an inverse relationship, while low cost and high quality cannot be achieved at the same time. Lean management believes that a smooth and efficient production process is essential. The rational design of the production process, uniform-input material, the shorten production time can bring the unity of low cost and high quality.

**Attitude to Defect**

The traditional production management believes that waste is impossible to avoid in production process. Establish feedback mechanism in the production process to make the product quality defects found and fixed as soon as possible. Lean management believes that the defects can be avoided. "Zero defects" is a standard which can promote the enterprise constantly finding defects and restructuring.

**Flexible**

Traditional production management believes that the improvement of enterprise flexible is at the expense of the cost. Lean management believes that although it is difficult to achieve business flexibility, but that does not mean additional costs again. Flexible production by cell production, change the original mode of production. Flexibility is the ability of companies to quickly adapt to environmental change, and therefore can reduce the uncertainty caused by the external environment.

**Characteristics of Power Production in Hydropower Enterprises**

Electric energy as power products has many characteristics of general merchandise, while it also has the following characteristics which just coincide with the lean management.

**Simultaneity of Electric Power Production**

As a kind of efficient energy, power generation, transmission, supply and utilization is at the same time to complete. Power generation, transmission, distribution and consumption closely link together to form a system. Any link problems will affect the security, stability, reliable operation of the whole system. This requires that every link of power system equipment has high reliability to ensure continuous and stable operation. This is similar to "teamwork" and the "quality first" concept of lean production. "Teamwork" concept emphasizes the zero defects, zero wait, and zero inventories in production process. Any step in the process of production must be safe, stable and reliable operation, if one process affected, then the entire production will be affected. "Quality first" concept is to ensure that every components are all qualified. The concept of lean production and the operation requirements of power generation enterprises are consistent.
**Randomness of Electric Power Production**

There are great randomness of the electricity load, system flow distribution, equipment accidents and other system accidents which change quickly, greatly and interacted with each other. Therefore, electric power production needs to monitor real-timely the change of system, dispatch reasonably, intervene timely, discover the unsafe state, and respond rapidly, efficient complete equipment maintenance. Lean production "Scene winning" concept and "flow" principle require that the enterprises pay attention to on-site observation, detect problems timely, and solve problems on the spot, so as to guarantee the balanced production. Therefore, the lean production mode can solve the production randomness of electric power.

**Not Easy to Storage and High Quality Requirements**

At present, the electric energy cannot achieve economic, quick and massive storage. Electric power production and consumption must be completed at the same time. Therefore, the electric power production required to achieve "zero inventory". Power system consists of power plants, substation, transmission line and the user. Power plant put all kinds of energy into electricity, through the booster substation, sent out by the transmission line, and then supply to users after several times decompression. In the process there are a large number of production equipment, such as transformer, transmission line, circuit breaker, monitoring, protection, etc. Power system equipment is complicated, involving multiple voltage grades and research areas. While the quality of system voltage and frequency is directly related with the quality of the users’ terminal products, the security of system and the reliability of electricity. So, no waste and stable operation is very important in electric power production. Specific measures include: First, expose equipment operational problems timely; Second, monitor the scene with the advanced system; Three, standardize to reduce unnecessary power production operation mistakes; Four, the spirit of continuous improvement; Five, high quality talent. These are also advocated by lean production ideas and principles. So, lean production can completely solve the storage problems of electricity, and be accord with the requirement of electric power production strictly.

**Conclusion: Applicability of Lean Management in Hydropower Enterprises**

As a successful application in many industries, lean production is based on the cost control of enterprise to realize the profit maximization and cost minimization. With the development of power market, to maintain profits, the electric power enterprise must make adjustments and constantly excavate internal potential. Lean management is committed to continuously optimize theory and method which provides effective guidance take an intensive road for the production of power generation enterprises.

**Operation and Maintenance**

Operation and maintenance management is the main content of management in hydropower enterprises. The "unattended" operation mode is people-oriented, the performance of technology innovation, and the necessary condition to create a world-class hydropower station. Hydropower operations want to achieve "unmanned", in addition to the necessary premise that hardware technology progress, more inseparable from the strong support of the lean management. The first is standardization. Unmanned station must establish a strict management system, a clear task allocation, clear rules and regulations to ensure efficient operation. The second is the process optimization. Only by constantly optimizing the process, truly implement various system standards to ensure the normal operation of all links unattended. The third 5S site management. To fully implement the unattended operational mode, staff must have good lean management consciousness and good on-site quality that can leave no crisis and the hidden trouble in operation to ensure safe operation of power generation equipment.
Equipment Maintenance

The difference between lean and traditional repair: The former evaluated equipment conditions as the starting point, controlled the standardization of maintenance schedule, and stressed the information management of data. The latter is the result of equipment failure as a guide, which may be arbitrary in repair costs and maintenance schedule, lack of a relatively complete maintenance process management. Due to water restrictions, maintenance is generally carried out in the winter season; the other time must try to guarantee the safe and stable operation of unit equipment. Equipment maintenance is the purpose of maximum avoids accidents, improve equipment utilization, and reduce maintenance costs. Therefore, a condition-based lean maintenance can avoid excess maintenance, prevent equipment loss due to unnecessary disassembly, while maintenance plan can effectively avoid the serious accident happened.

Collaborative Management

Collaborative management emphasis on effective cooperation between each element under the unified target, take full advantage of each other, achieve a win-win situation on the basis of resource sharing. The importance of lean collaborative management is through the full integration of all the advantages that can quickly respond to and cope with change; at the same time, each link closely will reduce the dominant circulation costs and invisible communication cost, avoid the cost waste greatly and improve the comprehensive benefit. Hydropower projects usually have a large scale, technical complexity and so on. Collaborative management can make full use of social resources to solve hydropower technology problem, achieve the efficient allocation of human resources by labor supplement, and deal with local environmental and development issues through close cooperation with the government.

Risk Management

Important principles of lean management include zero defect, continuous improvement and high quality. These principles are applicable to the effective risk management. Whether the risk of product quality or the risk of equipment failure is likely to make the enterprise suffered huge losses, resulting in unnecessary waste. So risk management is an important part of lean management. The establishment of risk management system is conducive to the realization of a comprehensive quality management. Hydropower production with synchronization features, the problem of a link will affect the overall, and even lead to a total shutdown. Therefore, early warning and control of risk is great important to guarantee the safe and stable operation of hydropower.

Flexible Management

Lean management goal is to save cost. Fast response is one of the important characteristics. With the market environment changing, quickly adapt to change and take corresponding action is higher requirements for the enterprise. Flexible management requires companies to stay flexible in changing market, make full use of various resources. Hydropower enterprises in the operation process will face multiple technical problems, require flexible and effective treatment. At the same time, in order to ensure the safe and stable operation of hydropower, cultivate versatile employees become the necessary demand.

With the transformation of economic development patterns, lean management has gradually become the inevitable choice of power generation enterprise management mode. In hydropower enterprise, lean production management thinking is applied to operation maintenance, equipment maintenance, collaborative management, risk management and the flexible design. Lean management can reduce the cost, improve economic efficiency, enhance core competitiveness, and further promote the intensive development of hydropower enterprises.
References


