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## FAILURE INVESTIGATION IN THERMAL POWER PLANT AND ENLIGHTENING PERFORMANCE BY USING LEAN TOOLS

S. Janaki\*<sup>1</sup>, R. S. Vishnuvardhan<sup>2</sup>, K. Sadesh<sup>2</sup>, A. P. Senthil Kumar<sup>2</sup>

<sup>1</sup>\*Department of Mechatronics Engineering, SNS College of Technology, Coimbatore, Tamil Nadu, India.

<sup>2</sup>Department of Mechanical Engineering, PSG College of Technology, Coimbatore, Tamil Nadu, India.

### ABSTRACT

Sustainable power source assumes a key job in the progress toward a low carbon economy and the arrangement of a protected supply of vitality. Geothermal vitality is an adaptable source as a type of manageable power source that satisfies the standard need. since some geothermal power plants, (GPPS) faces various frustrations the essential of a technique for gathering planning to abstain from or decrease potential disillusionments is huge. Since no specific conveyed record of considering a FMEA associated with packs with essential disillusionment mode shave been found starting at now in this paper the utilization of dissatisfaction modes and effects assessment FMEA as an invaluable technique for choosing to describe and separating normal frustrations in an ordinary application is considered. Consequently a legitimate peril scoring of occasion area and earnestness of frustration modes and figuring the danger need number RPN for recognizing high potential disillusionments is cultivated. To help exactness and ability to research the method approval writing computer programs are utilized.

### KEYWORDS

Renewable energy, Geothermal energy, Failure Modes, Effects Analysis, Risk Priority Number and XFMEA.

### Author for Correspondence:

Janaki S,  
Department of Mechatronics Engineering,  
SNS College of Technology, Coimbatore,  
Tamil Nadu, India.

**Email:** [janakis.cbe@gmail.com](mailto:janakis.cbe@gmail.com)

### INTRODUCTION

Geothermal power is power generated by geothermal vitality advances being used incorporate dry steam power stations streak steam power stations and double-cycle power stations. Geothermal power age is as of now utilized in 24 nations while geothermal heating is being used in 70 nations. Starting at 2015 overall geothermal power limit adds up to 12.8 Giga Watts GW of which 28 percent or 3 548 Mega Watts are introduced in the united states because of current geologic information and innovation the geothermal

energy association gauges that lone 6.5 percent of all-out worldwide potential has been tapped up until this point while the IPCC reported geothermal power potential to be in the scope of 35 GW to 2 TW. Nations producing more than 15 percent of their power from geothermal sources include El Salvador Kenya the Philippines Iceland. The greenhouse gas emissions of geothermal electric stations are by and large 45grams of carbon dioxide per kilowatt-hour of power or under 5 percent of that of regular coal-terminated plants<sup>1</sup>. Geothermal electric stations have as of not long ago been constructed solely where high-temperature geothermal assets are accessible close to the surface. The advancement of binary cycle control plants and enhancements in penetrating and extraction innovation may enable enhanced geothermal systems over a lot more prominent land range<sup>2</sup>. Showing undertakings are operational in landau-Pfalz Germany and south-sous-forest France while a previous exertion in Basel Switzerland was closed down after it activated tremors. Other exhibition activities are under development in Australia the United Kingdom and the United States of America. FMEA methodology initiates with assessing configuration detail delineating hardware square charts and perceiving every single potential disappointment individually.

#### **Failure Analysis of Power plant**

The failure examination of a Geothermal power plant is performed using XFMEA. Pareto diagram is a visual outline. The lengths of the bars address repeat or cost (time or money) and are composed with the longest bars on the left and the shortest to the other side. Thusly, the chart depicts which conditions are continuously imperative.

#### **Facility layout**

Offices are characterized as the workspace and hardware expected to complete the operations of the association. This incorporates workplaces, production lines, PCs, and trucks. The area, plan, and design of an associations' offices are integral to powerful the efficiency of the general operations system.

#### **Facility Design Layout**

In the wake of picking the workplace's zone, the accompanying stage in operations planning is to

structure the best physical plan for the workplace. The available space ought to be reviewed with workstations, equipment, accumulating, and various merriments that ought to be engineered. The fact is to mull over the most capable work process without intrusion. A workplace that has carefully composed its organization will think about the dynamically ground-breaking and viable work procedure and produce its extraordinary or services to a high standard.

There are three sorts of work procedure designs that chiefs can peruse:

1. Methodology configuration: sorted out in divisions (e.g., facilities).
2. Product layout: creation line (e.g., a vehicle get together plant).
3. Fixed-position configuration: creating a huge thing (e.g., colossal fly).

#### **Facility Layout Considerations**

Do the plan and design take into account development or change? Is there an opportunity that your organization will encounter huge development? Could some other change come about that could impact the format of your office? In business, the sky is the limit. Ensure that the equivalent is valid for your office design. While making changes is expensive and undertaking them shouldn't be messed with, your format should be adaptable enough to permit an update if the circumstance calls for it. Is the procedure stream smooth? On the off chance that you are running a manufacturing plant, for instance, the stream ought to be with the end goal that the raw materials enter toward one side and the completed item exits at the other. The stream doesn't need to shape a straight line, yet there ought to be no backtracking. Backtracking makes disarray. Representatives get confounded ("Has that been done yet?"), parts get lost, and coordination is troublesome. You need a smooth procedure to be productive. Are materials being taken care of effectively? Here straightforwardness is ideal. Does the office design help the business in gathering its generation needs? Is there enough space and is it utilized effectively? Have you permitted enough space for delivery and getting? Can various zones of

the business convey adequately? Does the format fit limited time exercises?.

### Lean Six-Sigma

Lean Six Sigma is a procedure that depends on a community-oriented collaboration to improve execution by methodically expelling waste and diminishing variety. It combines lean fabricating/lean enterprise and Six Sigma to wipe out the eight sorts of waste:

- Shipping
- Stock
- Movement
- Pausing
- Over-Processing
- Over-Production
- Imperfections

Six-Sigma looks to improve the nature of procedure yields by distinguishing and expelling the reasons for imperfections (blunders) and limiting inconstancy in (assembling and business) forms. Synergistically, Lean plans to accomplish persistent stream by fixing the linkages between procedure steps while Six Sigma centers around lessening process variety (in the entirety of its structures) for the procedure steps in this manner empowering a fixing of those linkages. To put it plainly, Lean uncovered wellsprings of procedure variety and Six Sigma plans to lessen that variety empowering a highminded cycle of iterative enhancements towards the objective of a ceaseless stream. Lean Six Sigma utilizes the DMAIC phases like that of Six Sigma. Lean Six Sigma tasks involve parts of Lean's waste end and Six Sigma center around diminishing imperfections, based on critical to quality characteristics<sup>3</sup>.

Vitality investigation in a geothermal plant can include the utilization of few lean instruments, for example, XMFEA examination to discover all the potential reasons for the vitality squanders and preventive moves that could be made to maintain a strategic distance from those<sup>4</sup>. Lean Six Sigma is a synergized administrative idea of Lean and Six Sigma. Lean generally centers around the end of the seven sorts of squanders delegated surrenders, overproduction, transportation, pausing, stock,

movement, and over-handling. In XFMEA investigation, when breaking down information about the recurrence of issues or causes in a procedure. XFMEA can be utilized when there are numerous issues or causes and you need to concentrate on the most noteworthy. It very well may be utilized when investigating wide causes by taking a gander at their particular segments. It tends to be utilized when speaking with others about your data<sup>5</sup>. In the geothermal plant's segment, universal markets developed at a normal yearly pace of 5 percent throughout the most recent three years and worldwide geothermal power limit is relied upon to arrive at 14.5-17.6 GW by 2020<sup>6</sup>. The DMAIC toolbox of Lean Six Sigma contains all the Lean and Six Sigma devices. The preparation for Lean Six Sigma is given through the belt based preparing framework like that of Six Sigma. The belt staff is assigned as white belts, yellow belts, green belts, dark belts, and ace dark belts<sup>7</sup>.

For every one of this belt, levels range of abilities are accessible that depict which of the general Lean Six Sigma apparatuses are required to be part at a specific Belt level. These ranges of abilities give a point by point portrayal of the learning components that a member will have obtained in the wake of finishing a preparation program. The level of whereupon these learning components might be connected is likewise portrayed. The ranges of abilities reflect components from Six Sigma, Lean and different procedure improvement techniques like the theory of constraints (TOC) total gainful maintenance (TPM)<sup>8</sup>.

### Problem Statements

In the wake of separating GPPs frameworks into congregations, distinguishing disappointment modes and related dangers which can hugely affect the wellbeing of parts is fundamental. It is commonly acknowledged that the vast majority of the disappointments are not coincidental. In this way, they can be averted. Specialists can recognize disappointment modes through the experience of using segments. It is basic to figure out what sort of makes lead disappointments. This training could assist specialists in preventing outstanding

disappointment modes by picking fitting restorative activities. Since every disappointment mode may have some genuine consequences for frameworks, the impacts of basic disappointment modes in GPPs are recorded. And afterward the issue with higher RPN number is given more significance and vital safeguards are taken.

**OBJECTIVES**

To analyze the various failure causes of geothermal

plant and to optimize the existing layout design.

**RESULTS AND DISCUSSION**

**GAUGE R and R**

To viably examine the security proportions of the Geothermal plant, review 4 wellbeing gear and have a nitty-gritty Gauge R and R and do the ANOVA technique to break down that hardware.

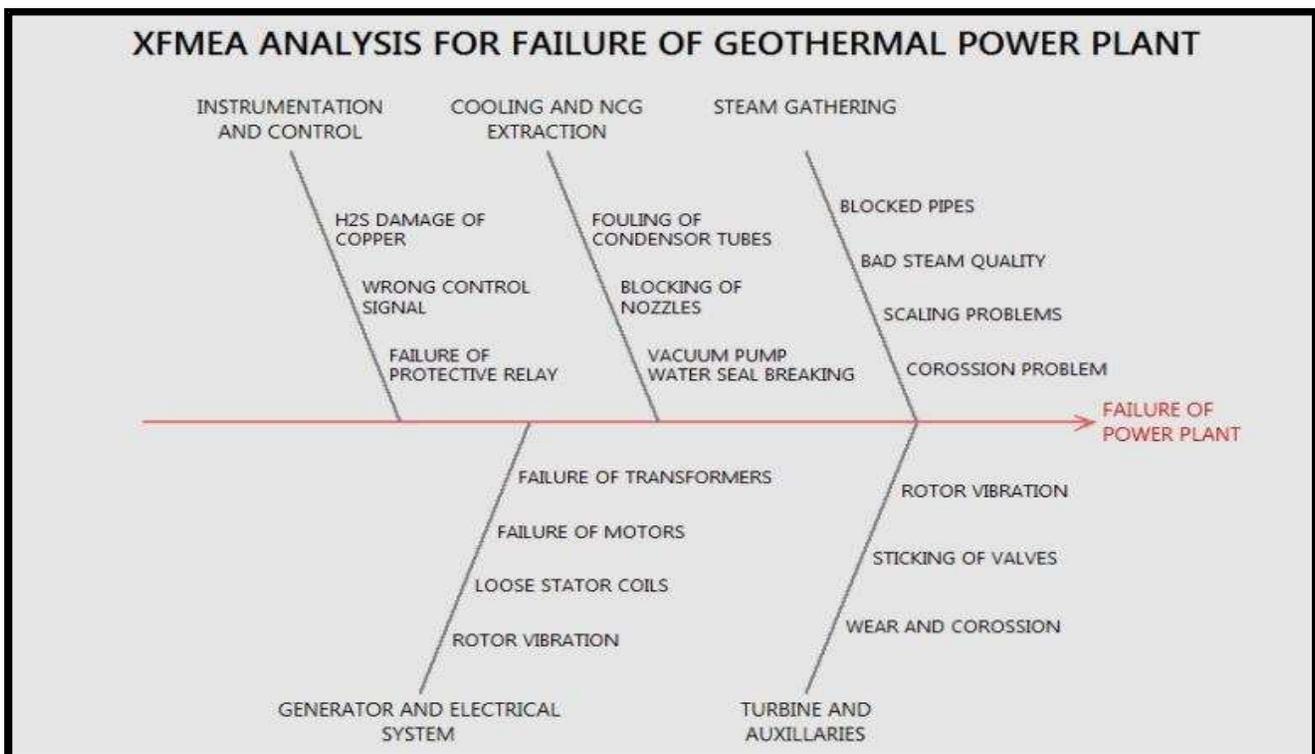


Figure No.1: XMFEA Analysis

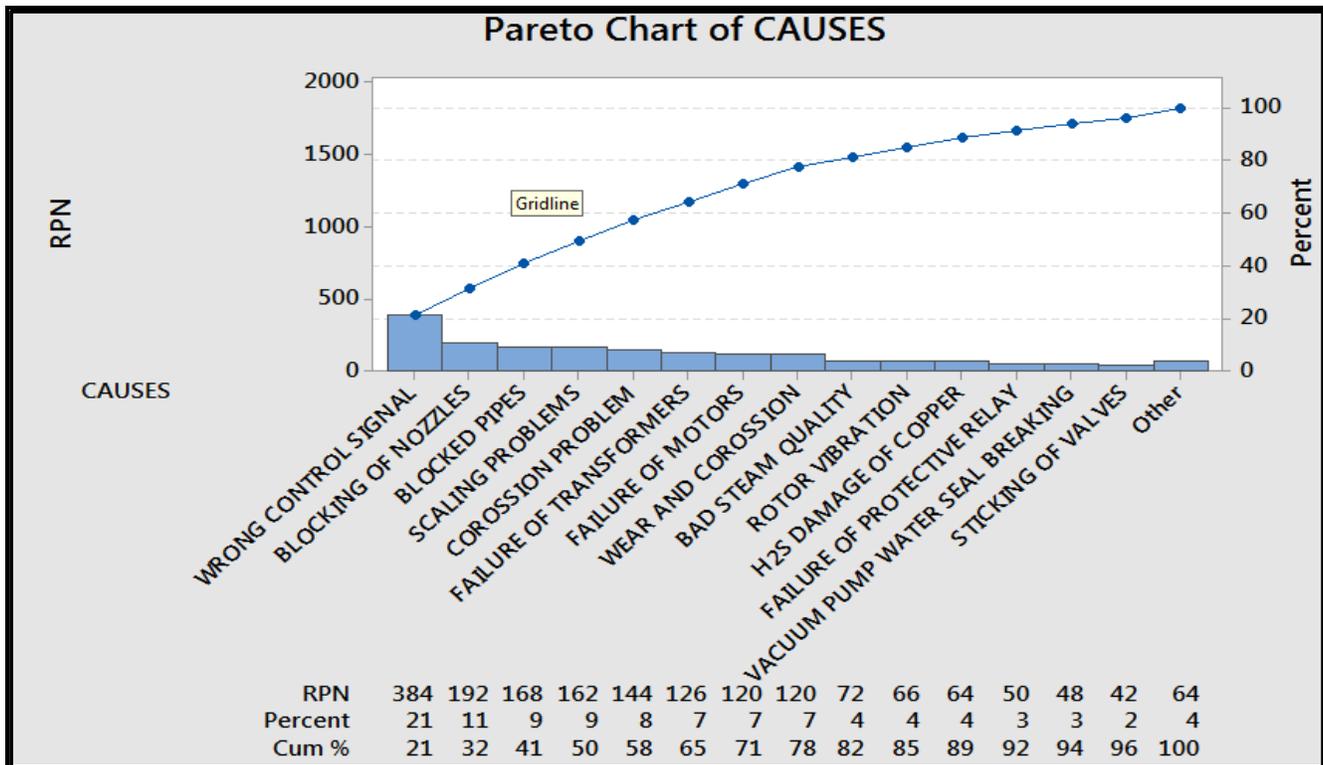


Figure No.2: Pareto chart

## CONCLUSION

**Failure analysis of GPP:** It is obvious that identifying, controlling and decreasing potential failures in GPPs are crucial needs. Since, no specific published record of considering an FMEA applied to GPPs with common failure modes have been found already, in this research, risk analysis of geothermal power plants using FMEA as a useful technique is studied to focus on the prediction of possible failure modes and eliminate potential failures during the design and the operation of GPPs. Accordingly, the most crucial failure mode is the wrong control signal with RPN 384. Hence necessary measures had to be taken for correcting the wrong control signal. Similarly, the lowest RPNs refer to Rotor vibration and loose stator coils with RPN 24. Geothermal brine is the main reason for the issue. It causes a variety of operational problems included well and line plugging, reduced streamflow, power production losses, equipment damage and failure, equipment repair and replacement, and complete or partial plant shut down. Hence lean tools such as Pareto analysis are used for determining the failure causes of GPP as

shown in Figure No.1-2 and to provide a way for improving its performance. **Facility plant layout:** In this manner the given office design is streamlined utilizing VIP PLANOPT programming by utilizing the stream framework module and the above method. This will at last lead to diminished space necessities and the decreased development of assets inside the plant by fulfilling the prerequisites. **Gauge R and R of Safety Equipments:** The distinctive wellbeing gear has been thought about and Gauge R and R is completed to dissect the hardware's utilizing Anova.

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## CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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