

Applying Gemba Kaizen at SKS Separator in cement plant: A case study

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Abstract— In today's competitive global market it necessary to reduce cost of production otherwise it will be very difficult to survive for any organization. Small and continuous improvements in quality, cost reduction, efficient delivery, Innovation, Increase productivity and safety are necessary for any organization. These can be achieved by Kaizen, a Japanese philosophy. For this industries are required to develop Kaizen culture with participation of workers, supervisors and management. In Panipat cement Plant various teams for Kaizen are made and improvement is done at different places and results are appreciating.

Keywords—Gemba (Real place), Gimbetsu (Machine, Tools, Rejects, Customer's complains), Kaizen (Continuous Improvement), Muda (Waste),

I. INTRODUCTION:

Kaizen was created in Japan following World War II. The word Kaizen means "continuous improvement". It comes from the Japanese words ("kai") which means "change" or "to correct" and ("zen") which means "good".^[1, 2] Kaizen is a system that involves every employee - from upper management to the cleaning crew. Everyone is encouraged to come up with small improvement suggestions on a regular basis. This is not a once a month or once a year activity. It is continuous. Japanese companies, such as Toyota and Canon, a total of 60 to 70 suggestions per employee per year are written down, shared and implemented.

In most cases these are not ideas for major changes. Kaizen is based on making little changes on a regular basis: always improving productivity, safety and effectiveness while reducing waste.

Suggestions are not limited to a specific area such as production or marketing. Kaizen is based on making changes anywhere that improvements can be made. Western philosophy may be summarized as, "if it isn't broke, don't fix it." The Kaizen philosophy is to "do it better, make it better, and improve it even if it isn't broken, because if we don't, we can't compete with those who do."

Kaizen in Japan is a system of improvement that includes both home and business life. Kaizen even includes social activities. It is a concept that is applied in every aspect of a person's life.^[1]

Difference between Kaizen and Innovation

The evolution consists of continuous improvements being made in both the product and the process. A rapid and radical change process is sometimes used as a precursor to *kaizen* activities. This radical change is referred to as *kaikaku* in Japanese. These revolutions are carried out by the use of methodologies such as process reengineering and a major product redesign. These kinds of innovations require large investments and are based, in many cases, on process automation. In the United States, these radical activities frequently are called *kaizen blitzes*.

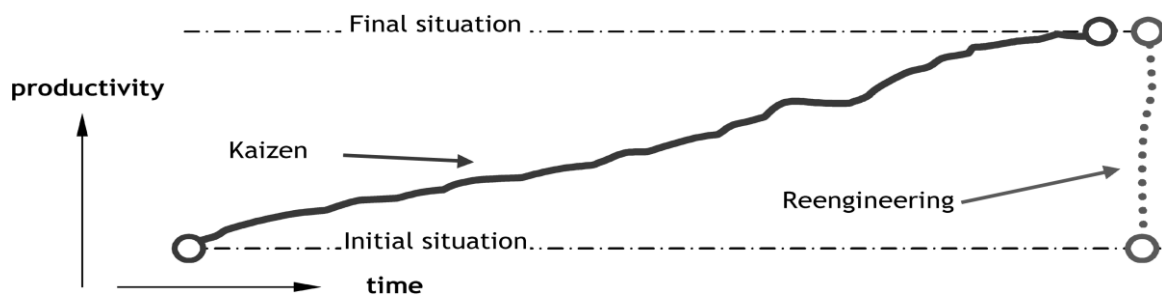


Figure: The concept of continuous improvement versus reengineering.

If the process is being improved constantly, as shown in Fig. above (continuous line), the innovation effort required to make a major change can be reduced, and this is what *kaizen* does (dotted line on the left). While some companies focus on meeting standards, small improvements still can be made in order to reduce these expensive innovation processes. Hence innovation processes and *kaizen* are extremely important. Otherwise, the process of reengineering to reach the final situation can become very expensive (dotted line on the right).

II. GEMBA:

Gemba means real place where the all the value added activities takes place. The major activities which are taking place are developing, producing and selling the products. Traditionally it is assumed that production is a secondary thing and management focuses on other activities which show direct return such as financial department, marketing and product development is done. Gemba focuses on where actual work is done. Taking attention to the real place the productivity can drastically be increased. Gemba is everywhere such as in service sector customer comes in contact with the services offered. As in Hotels Gemba is at reception, lobby, kitchen and guest rooms. In banking sector Gemba is at teller, at desk of loan manager and at financial advisor that is every place where value added services are offered. Thus Gemba span is very wide. Generally managers think that Gemba is at their desk only. They keep distance with other Gemba events and come across other Gemba through statistical data or occasional visit to the work place.

For effective production managers should focus on all the Gemba events which give the real picture of Gemba than just the data through reports. Managers should frequently visit the Gemba. There are 5 Gemba principles

- i. When a trouble happens go to Gemba first.
- ii. Check the Gimbetsu (machines, tools, rejects and costumer complain).
- iii. Take temporary counter measure on the spot.
- iv. Find out the root cause.
- v. Standardize for prevention for recurrence.

Gemba Kaizen:

Problems found at Gemba are solved by managers using different techniques and ideas. Generally there are two approaches used by managers: ^[4]

- A. Innovation using latest and high cost technology, which requires a lot of money.
- B. The other approach is Kaizen or Kaizen at real place called Gemba Kaizen.

The three ground rules of Gemba in an organization are

1. **Housekeeping:** In any organization housekeeping means employees acquire self-discipline.
2. **Muda elimination:** Muda a Japanese word having meaning “waste” which is to be removed
3. **Standardization:** means a practicing or best way of doing work.

A further explanation of Muda:

- **Muda of over production-** Producing more than customer requirement and stock of excess finished product costing in storing and handling.
- **Muda of Inventory-** This is caused due to over production and material lying without any value added to it.
- **Muda of waiting-** Man or machine wait for further work does not add value to the product.
- **Muda of motion-** When worker move around for picking tools or material, it does not add value to product.
- **Muda of transportation-** When material moves on truck or conveyor it does not add value to it.
- **Muda of producing rejects-** Producing rejects means to rework or complete product is to be thrown away.
- **Muda of processing-** By rearranging the work process we can eliminate some processes.

The concept of removal of Muda is Kaizen or Lean kaizen.

III. KAIZEN TECHNIQUES

Kaizen can bring dramatic improvement in any individual; organizations can improve exponentially by adopting Kaizen culture in the organization. It is the way in which every person in the organization is inspired to adopt this concept and coordinating and sharing the ideas. If ideas are fruitful the persons are recognized and awarded. Which inspire the each one in the organization to come with new ideas and positive thinking. These are the techniques managers can adopt or may bring Kaizen consultant who brings out the new ideas from employees and make an environment to continue this process. Quality Circles, Kanban, Line Balancing and 5S are some techniques used to implement the Kaizen.

Steps to Improvement

1. Select the dates, times and venue for the kaizen event as well as an industry established consultant to lead the event. Be sure to select a time of year that is slow for the company, as the event will take the bulk of your employees away from their work for an extended period of time.
2. Choose a focal point for the event. Some kaizen events focus on large scale improvements and some concentrate on small scale. Both approaches have their advantages and disadvantages and it will depend on the specific needs of your company to decide which will work best for you.
3. Consider your goals for the event and establish realistic expectations. Clearly establish what you hope to take away from the event. Decide if your company needs immediate and hefty change in order to be successful, or can the changes be minor and still have a positive result.
4. Choose a large scale improvement plan if the company is in dire need of a great leap in productivity and effectiveness. If successful then the results will have profound impact. The disadvantage to this plan is that large scale improvement also means large scale change, which can be a challenge to implement, especially quickly.
5. Select a kaizen blitz or a smaller, more localized strategy if the company productivity and policy only needs tweaking. This would be considered a small scale improvement. While the impact is more limited the changes are typically minor and easier to implement.

IV. KAIZEN WORK AT CEMENT PLANT

In the Panipat Cement Plant Kaizen culture is developed and different teams for improvement and suggestions were formed. These teams take suggestions from employees about improvement in their section for better quality, cost reduction, improving delivery service, innovation, increasing productivity and increasing safety.

Using suggestions and observations team analyses and check for feasibility of the suggestions implement the works and observe the Improvement in result area as QCDIPS (Quality, Cost, Delivery, Innovation, Productivity, and Safety).

SKS separator Reject Modifications:

Before Modification:

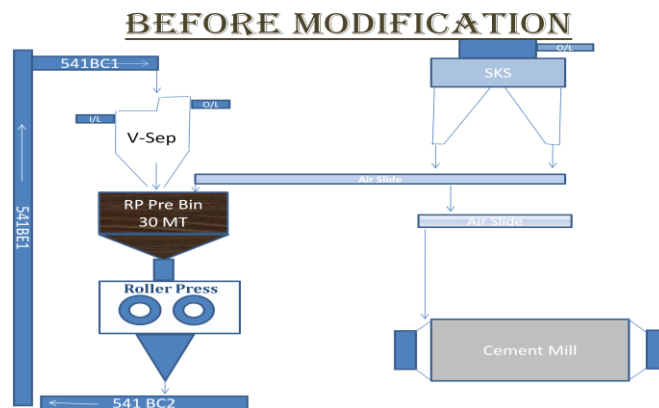
- SKS Reject fine material feeding was in Roller Press pre bin 40 to 50 % as per design. (Due to Mill size small unable to feed 100 % material towards mill side)
- 50% to 60% SKS reject material feeding in cement mill

Problems were:

- Higher fine in Roller Press pre bin because SKS reject fine material was feeding directly in RP pre bin.
- Higher Skew (gap difference) in roller (9 – 15 mm).
- No equal load at both rollers.
- Both rollers Current differences higher.
- Higher Vibration in Roller press.
- Higher SKS RPM for maintain Blaine.
- Frequent operation of shut off gate & Control gate due to higher skew.

Parameters before modification were:

- Current variation both Roller -1000 to 1550 KW
- Pressure variation on both roller- 60-120 bar
- Skew(Gap difference) - 9 to 15 MM
- SKS RPM – 1150-1200
- Pneumatic Gate Operation – 4-5 time/Hr.
- Production – 195-200 TPH



What Modifications were done?

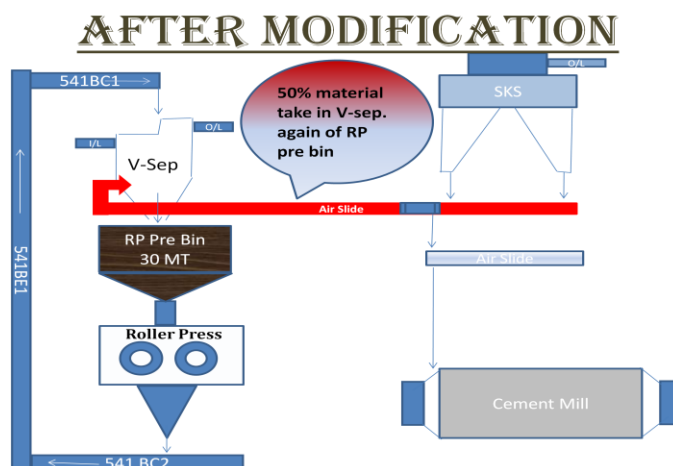
- 50%SKS Reject fine material taken direct in V-Separator Inlet in place of pre bin by provide air slide from SKS to V- separator.
- Remaining 50% SKS reject material taken in cement mill

Benefits of the modifications:

- Reduce fine in Roller Press pre bin.
- Roller Press running smooth.
- Skew problem reduce up to 4-7 mm
- Equal load at both rollers.
- Reduce SKS RPM (30-50 RPM)
- No vibration in Roller Press.
- Increase Production (4-5TPH).
- Reduce shut off gate operation.

Parameters after modification:

- Current at both Roller -1400 to 1500 KW
- Pressure on both roller- 100-120 bar
- Skew(Gap difference) reduce to - 4 to 7 MM
- SKS RPM – 1050-1140
- Pneumatic Gate Operation – 1-2 time per 8Hr.
- Production increased up to – 5 TPH

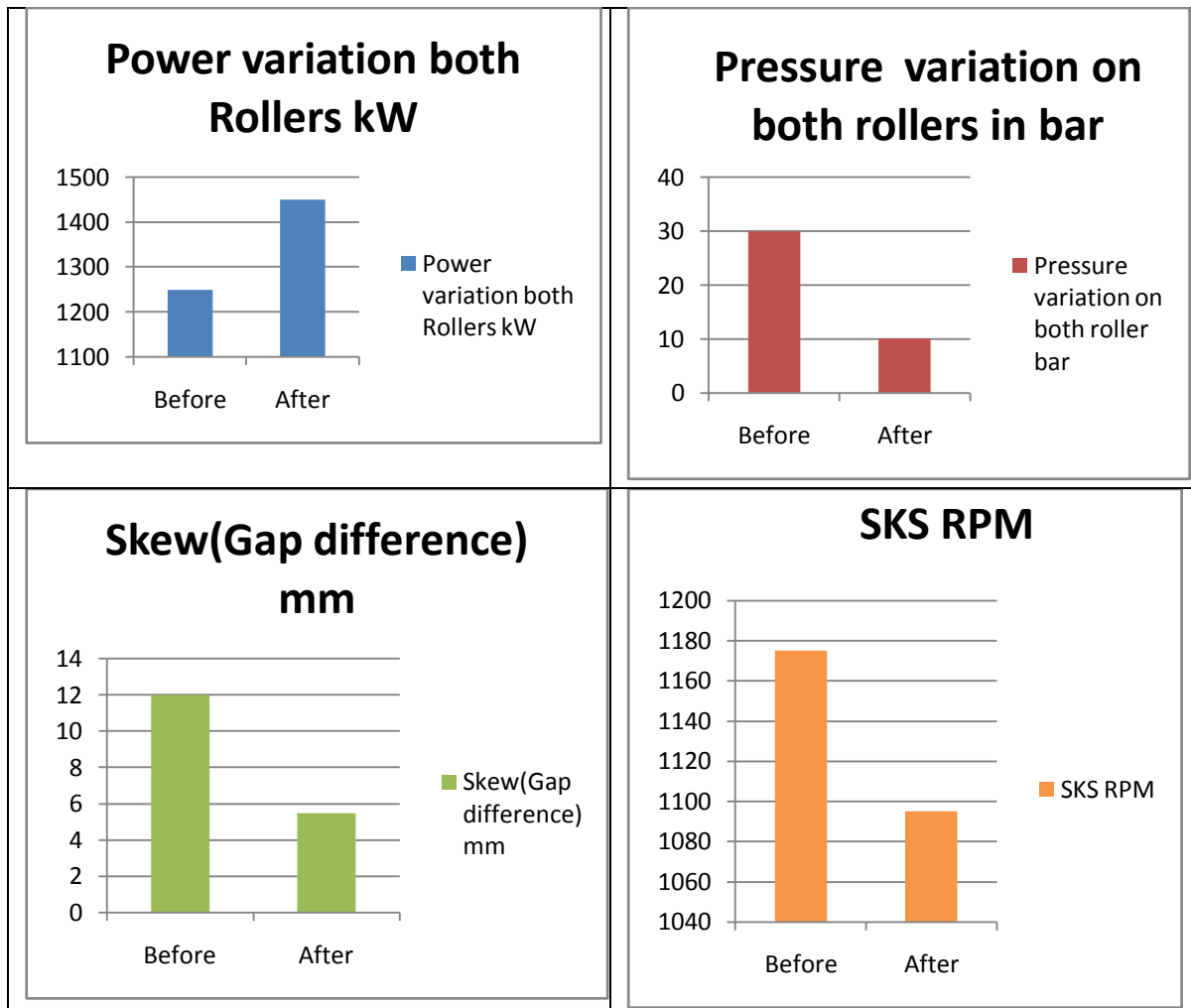


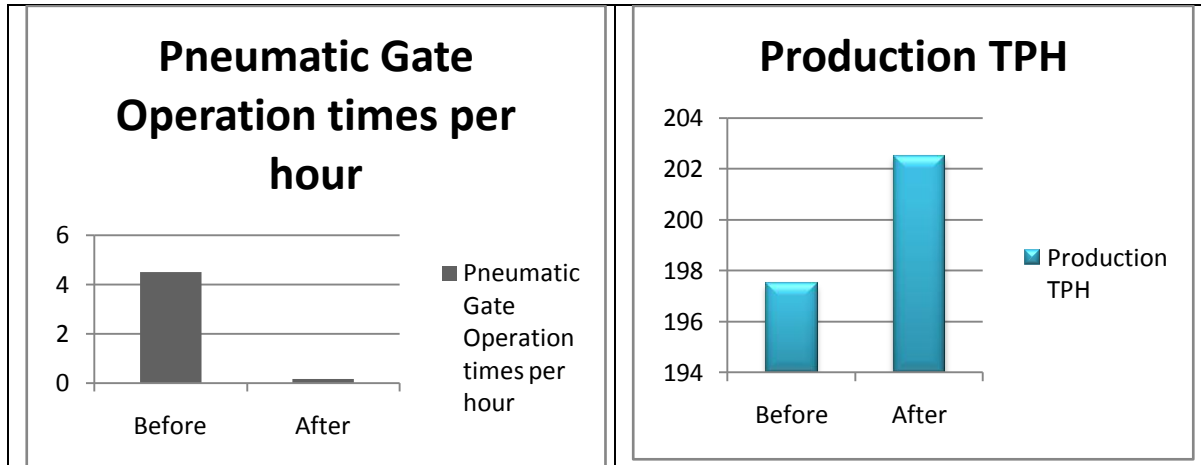
V. RESULT AND ANALYSIS:

In above Gemba Kaizen events the improvements are as follow

S. No.	Parameters	Before	After	Results
1.	Power variation both Rollers	1000 to 1500 kW average 1250 kW	1400 to 1500 kW average 1450 kW	More power due to high production.
2.	Pressure variation on both roller	60 to 120 bar variation of about 30 bar	100 to 120 bar variation of about 10 bar	Variation in pressure reduced and smooth operation
3.	Skew(Gap difference)	9 to 15mm average 12 mm	4 to 7 mm average 5.5 mm	More fine material at out put
4.	SKS RPM	1150 to 1200 average 1175	1050 to 1140 average 1095	Less Speed
5.	Pneumatic Gate Operation	4 to 5 times/hour average 4.5 times/hour	1 or 2 time in 8 hour average 0.1875 times/hour	Drastic change in gate operation causing reduction in labor and improve production
6.	Production	195 to 200 TPH average 197.5 TPH	200 to 205 TPH 202.5 TPH	Production Increases

The results of various parameters are as shown in Charts:





*For all Charts average value of parameters is taken

Thus above charts show that:

- Power Consumption Increases due to higher production and fine material
- Pressure variation is low assuring smooth flow
- Less skew means fine material
- Drastic reduction in operation of shut off gate saving labor and increase production.
- Production increased

VI. CONCLUSION:

Kaizen is an interesting process to apply to cement plant. It produces, in most cases spectacular results. It is not disruptive; however, it takes a commitment of the whole organization including the President or CEO to labor. The above illustrated example is a small sample of over 30 performance appraisals carried out in Cement Plant over the last 3 year period. The good news is that it works. It is truly an exciting journey in human engineering.

VII. ACKNOWLEDGEMENT:

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