

METHODS FOR TIME OPTIMIZATION OF SEC MAKE 300 MW TURBOGENERATOR CAPITAL OVERHAULING

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ABSTRACT:

This paper provide the innovative approach towards the time optimization of SEC make 300 MW turbogenerator during capital overhauling by adopting different methods. The existing overhauling duration is 35 days from barring stop to barring start. This duration can be optimized by using suggested methods.

The turbine overhauling consists of three stages 1) Dismantling, 2) Inspection & repair 3) Assembly & commissioning. The use of innovative methods will save the time duration in all of the three stages of turbine overhauling.

The suggested methods are as

- 1) Job planning & execution,
- 2) Use of parallel Induction machines for casing stud opening,
- 3) Preparation of sufficient blasting sheds,
- 4) Tie up with expert machining agency,
- 5) Tie up with NDT agency for Stress relieving,
- 6) Execution of work on 24 hrs. basis,
- 7) Arrangement for workers,
- 8) Reshuffling in sequence of work,
- 9) Use of advance technique

By use of all above methods the capital overhauling duration can be optimized up to 30 days.

ABOUT THE AUTHOR(S)



Mr. Tushar Pande is working as DGM (HOD - Mechanical), JSW Energy Ltd. has completed his Bachelor of Engineering in Mechanical Engineering from Amravati University. He joined JSW in the year 2012 as AGM and has rich experience in diverse areas such as, Operation, Mechanical Maintenance, Renovation and Modernization etc. He has led the team which was associated with the capital overhauling of turbogenerator of JSW Energy Ltd., Ratnagiri Station.



Mr. Anilkumar Jaiswal currently working as Dy. Manager (Turbine Mechanical Maintenance), JSW Energy Ltd. has completed his Bachelor of Engineering in Mechanical Engineering from Dr. Babasaheb Ambedkar Technological University, Lonere and joined JSW in 2007 as Graduate Engineer Trainee. He has been

associated with erection during project & then Mechanical Maintenance Works of Turbine & Generator. He was part of the team which was associated with the capital overhauling of turbogenerator in Unit # 3 & 4 of JSW Energy Ltd., Ratnagiri Station.

INNOVATIVE METHODS:

1. Job planning & execution:

Preparation of master schedule, identification of critical path activities & preparation of action plan for critical path activities in advance.

The daily shutdown meeting shall be conducted for discussion of findings & next day planning. The damaged component list shall be prepared immediately after completion of dismantling, so that spares can be identified in stores & shall be issued on site dimensional & fitment checking.

This will avoid delay for turbine assembly work.

2. Use of parallel Induction machines:

The induction bolt heating machines are used during capital overhauling for following activities

- HIP & LP Turbine casing parting plane studs opening while turbine dismantling,
- HIP& LP Turbine casing parting plane gap & ovality check
- HIP& LP Turbine casing parting plane stud tightening after box up.

Usually the overhauling vendor brings only one number of machines for all this work. The use of two numbers of machines in parallel for above works will reduce the time duration to almost half as compared to use of one machine.

3. Preparation of sufficient blasting sheds:

The Blasting shed required for cleaning of turbine components by using alumina powder during overhauling. The two number of blasting shed with sufficient manpower will allow working in parallel for cleaning of turbine components.

As by using two shed turbine components will be cleaned in parallel & blasting work will be finished earlier. The early readiness of turbine components will start the NDT & component centering work earlier. In this way the turbine overall the duration will be reduced.

4. Tie up with expert machining agency:

During capital overhauling there are chances for occurrence of following machining jobs after dismantling of turbine & generator.

- Machining of generator seal rings
- Machining of excess dowel diameter of stud
- Preparation of bearing pad oil pocket
- Machining of keys & packers for centering
- Machining of oil catcher fins
- Machining of governing valve components

For execution of all these kind of jobs if advance tie up done with machining agency then it will save the time for searching of expert vendor during COH. Additionally advance purchase order will be cost effective & assurance for job completion.

This will avoid delay in overhauling duration as critical machining activities & vendors are already identified.

5. Tie up with NDT agency for Stress relieving:

As per earlier experience LP Turbine last stage blades lacing wire are found crack during LP rotor inspection. For attending this welding crack along with welding stress relieving work required. The time duration for attending one crack is 20 hrs.

Approximate 4 to 5 no's welding joints repairing work occurred in every overhaul. So in advance arrangement of two number of stress relieving machines will reduce the duration for attending the lacing wire welding crack.

6. Execution of work on 24 hrs. basis:

Use of additional skilled manpower eg.Engineers & technicians in night shift will ensure the equal quantity & quality of work as that of general shift.

By using this method night shift output can be more effective.

7. Arrangement for workers:

Making necessary arrangement like drinking water facility, lunch & dinner arrangement, rest area, toilet facility nearby the turbine overhauling unit will reduce the idle time of work.

The overhauling manpower will utilize these facilities & will spend maximum time duration on the work.

8. Innovative ideas:

The minor re-shuffling of activities & proper utilization of TG EOT cranes will be helpful for reduction of turbine overhauling duration.

For SEC make 300MW turbine following activities/methods can be used for reduction of overhauling time.

- Cross-over pipe installation after turbine pedestal box up.
- Installation of high capacity filtration machine in oil tank for achieving oil parameters
- Use of pad type of insulation instead of refractory type
- Starting of seal oil system flushing independently will permit for generator air leak test earlier.

9. Use of advance methods:

The use of advanced techniques like 3D laser scanning techniques & graphics need to be explored for turbine overhauling related activities like

- Turbine rotor coupling face run out check
- Turbine casing parting plane matching
- Turbine diaphragm centering
- Turbine rotor alignment check

Case Study:

JSW Energy Ltd. is having an imported coal based coastal Thermal Power Station of 4 x 300 MW capacity at Jaigad in Ratnagiri district of Maharashtra. These units were commissioned in the year 2010 – 2011.Till date three units of capital overhauling was carried out.

U#3 Capital overhauling duration was 35 days & overhauling was carried by normal ways. The single induction machine used, single blasting shed prepared, single SR machine used & no advance ties up done with machining agency.

The time taken to carried out activities are as per following table

Table-1: U#3 COH activities duration

Sl. No.	Description	Activity duration(Days)
1.	Use of single induction machine for bolt tightening & loosening	5
2.	Use of single blasting shed for blasting	8
3.	No Tie up with expert machining agency taken one day for vendor finalization	1
4.	Use of single stress relieving machine	3

So based on U#3 capital overhauling experience during U#4 turbine capital overhauling at JSW Energy Ltd, Ratnagiri the innovative methods are implemented & COH time duration is reduced from 35 days to 30 days.

Table-2: Summary of innovative methods used & time saving

Sl. No.	Description	Activity duration(Days)	Time saving(Days)	Service additional Cost (Lac)
1.	Use of parallel induction machine-machine cost	3.5	1.5	5
2.	Preparation of sufficient of blasting sheds-material & manpower cost	7	1	2
3.	Tie up with expert machining agency-minimum service cost	0	1	5
4.	Tie up with NDT agency for Stress relieving-machine cost	2	1	2
5.	Execution of work on 24 hrs. basis-Additional manpower cost	1	0.5	6

Cost benefit analysis:

- Additional service cost-20 Lacs
- Generation gain of one day considering full load of 300 MW-13 lacs
- Total generation gain in days-5
- Total generation gain in cost-65 lac
- Total savings-45 lacs

Conclusion:

These innovative methods are most effective with minor cost implication. By using these methods, the turbine capital overhauling duration reduction can be possible.