

Cost Effective Production Through Technical Auditing of Whole Mill

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ABSTRACT

Today the basic inputs of the industry like fibrous raw material, chemicals, energy and water are becoming increasingly scarce and the cost component of these inputs has gone up making the whole paper manufacturing process more expensive. Optimal utilization of these inputs through process optimization should help in achieving cost effective production. In the small pulp & paper units particularly using one or more non-woody fibrous raw materials, there is a wider scope to bring down the cost of chemicals and energy, through a systematic technical auditing of the whole mill. CPPRI during its energy auditing exercises, in some of the small mills, conceived the benefits accruing from the technical audit of the whole mill. The present paper highlights the approach and importance of technical auditing particularly in small pulp & paper mills and expected overall benefits.

Introduction :

The two very vital aspects for the survival and healthy growth of any industry are the cost effective production and quality consciousness. This is particularly true in the case of paper industry which uses a wide spectrum of raw materials and convert them into a wider range of products, with different specifications for numerous end uses. In the recent years the performance of the Indian paper industry is far from satisfactory basically due to lower capacity utilization and poor financial performance. Capacity of nearly 0.8 million tonnes per year has been closed primarily due to scarcity of raw material and inability to comply with environmental regulations. The reasons attributed to poor performance are inflating prices of basic inputs of the industry like raw materials, chemicals, energy & water, etc and recession in demand, use of outdated machinery and equipments, stringent, environmental regulations, conflicting ideals of labour and shortage of capital for required modernisation. With liberalization policies of the Govt. the industry has to compete in the open market with respect to quality and cost competitiveness. Consorted efforts are required at all levels including the management level to attain the above targets.

In the recent years, besides quality control, environmental & energy auditing, the technical auditing of the whole mill is gaining importance. Technical auditing takes into account the processes, process conditions, the quality of the products and the quantum of basic inputs. Thus technical auditing of individual section or department and the whole mill will ensure a broad scanning of the total system.

The present paper covers the advantages of technical auditing and need & awareness for such technical audits within the paper industry, whether the size is small or big.

Discussions :

CPPRI initiated the energy audits in small pulp & paper mills in 1989 and at that time preliminary exercise on the technical audit, in some of the mills, were carried out⁽¹⁾. During these studies it was observed that the mills use much more quantities of chemicals particularly bleaching chemicals, energy and water. There were clear indication of reducing those inputs, by a quite

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good amount by technical auditing. For successful implementation of cost effective production practices in a mill, it is necessary to have a systematic technical audit from raw material procurement to the finished product. For the same a technical audit cell must be created, consisting of atleast one member from each level of management and atleast one member from each department/section

and other organisational considerations. The primary objective of technical audit is to determine ways to reduce the basic inputs consumption per unit of product output.

Scope of technical audit :

Technical audit directs & controls the basic input resources because it can(4)—

- Analyse present consumption and past trends in details.
- Compare standard consumption to actual.
- Produce mass & energy balance diagram for the mill.
- Review existing mass & energy recording systems.
- Compare consumption with other locations, other firms, previous period and budget.
- Check records against invoices.
- Compare meter readings against records
- Check capacities and efficiencies of equipments.
- Check working of controls.
- Examines need for automatic controls.
- Consider training of management staff.
- Review new projects with respect to raw material, chemicals, energy & water use.
- Introduce monitoring procedures.
- Check frequency of reporting systems
- Examine & monitor resources saving techniques.

Present auditing trend in Indian pulp & paper industry :

Most of the Indian pulp & paper mill have no or limited technical auditing, resulting in higher consumption of basic inputs to produce one tonne of papers. Pulp & paper mills do have professionals competent to carry the technical auditing but, however, their priorities are primarily-production and quality and have not attached much importance for the whole mill technical auditing. Small mills in particular, often lack professionals, competent enough to do the technical auditing of the whole mill. At this stage such mills require a basic module of technical auditing as a guideline for carrying out the technical audit. The professionals at institutes like CPPRI, who are engaged in such exercises, can act as interface between management & production levels. The importance of conserving basic inputs like raw materials, chemicals, energy and water in the Indian paper industry need to be quantified, It is profitable not only with respect to savings of chemicals, energy, fibres and water but also helps to reduce the load on pollution as well as enables the paper mills to run close to their rated production or higher capacity utilization.

Basic approach of technical audit :

The technical audit must stick to some of the essential steps for efficient use of resources, which are given below—

- Identification — of areas of waste
- Investigation — measurement, to establish facts

Technical Auditing :

Technical auditing provides a systematic approach for decision making to conserve the resources(2,3). It attempts to balance all the basic inputs with its use. It is an effective tool in defining and persuing the improved use of resources. Technical audits will help to understand more about the ways raw material, chemical, energy and water are used in any industry and help in identifying the areas where waste can occur and where scope of improvement exists. In general technical audit is the translation of conservation ideas into reality by balancing technically feasible solutions with economic

Quantification	—	of losses & values
Decisions	—	on possible causes of action and choice of the best.
Presentation	—	of recommendations, reasons for making them, financial advantages.
Implementation	—	to ensure plan is followed
Follow up	—	check that estimated savings have been obtained. Did the alteration have any unforeseen effects ?
Set targets	—	to ensure new performance is maintained.
Re-examine	—	can further improvements be made.

of data available e.g. database etc. enabling to process the data by statistical methods. Another way is to store data and information in a mathematical model. Every pulp and paper mill can keep its own model where the most information will be stored. The most important aspect is that the model should be open to any alterations and consequences of adding of new information or making changes in model may be checked immediately.

Fig-1 shows the model chart for the mill with different control sampling points for technical auditing. Samples are drawn from various points of control tests in accordance to the schedule of sampling by the technical auditing cell and regular technical auditing is carried out. The performance of the processes and whole mill is compared with the standard norms, which are fixed based on the past performance and capability studies. The norms are reviewed periodically and new goals are set to meet specific results.

Quality control Vs technical auditing :

Quality control maintains records pertaining to quality of material purchased and the quality of the product. Whereas the technical audit performs three functions as—

- Quality of incoming raw materials and inputs.
- Optimisation of the process conditions.
- Quantification of basic inputs.

Quality control does not take into account the quantities of basic inputs and focuses only end product quality. Technical audit, on the other hand, while keeping in view the quality of end products does focus on the quantities of basic inputs also^(4,5).

Modules of technical auditing :

An effective technical audit should take into consideration the various sections of a mill and all the sections should be controlled with an integral modular approach by controlling basic inputs, processes and their variables, products and the cost of production through the application of analytical techniques, statistical methods, instrumentation and wet analysis. In this computer age⁽⁷⁾ there are many computerised banks

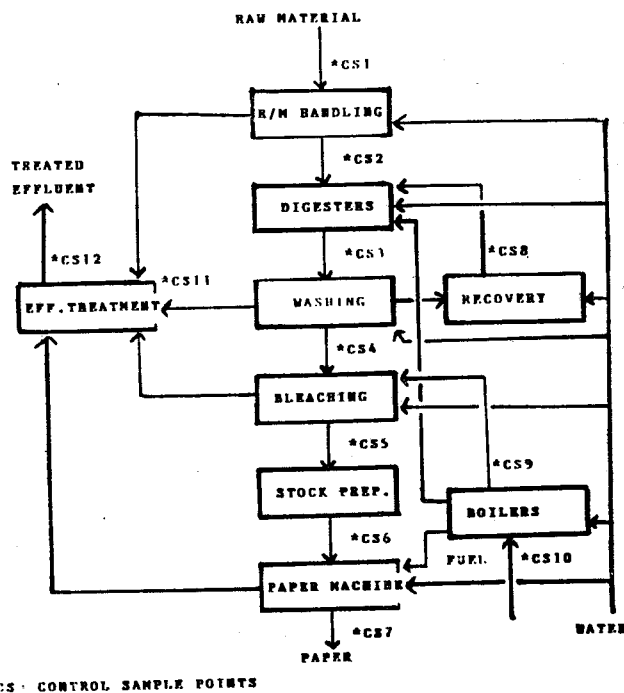


FIG-1. TECHNICAL AUDIT MODULES FOR A MILL.

Statistical methods, such as sampling plan, control charts, analysis of variance and test of significance are applied to analyse and interpret the results. A simple PC-XT can be very effectively utilized for these exercises

for improving the analytical ability of the technical audit cell.

Illustration of technical auditing :

Following are some of the examples of the technical auditing through control points.

i) The quality and uniformity of white liquor is one of the decisive factor in pulping. Proper chemical analysis and subsequently calculations for chemical charge will help in minimising the chemical and energy consumption in the digester section.

ii) Similarly unbleached pulp properties have a great bearing on the consumption of chemicals in bleach plants (Fig-2).

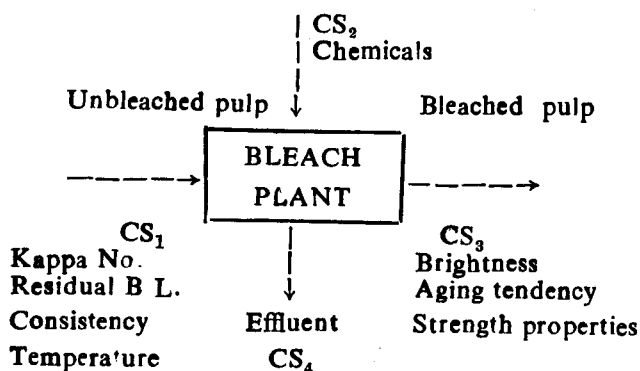


Fig-2, Technical Audit of Bleach Plant of a mill

Among the properties of the unbleached pulp, kappa no and residual black liquor carry over are the major factors to decide the chemical consumption in bleach plant and resulting brightness and strength properties of pulp. Therefore kappa no, residual black liquor, consistency, chemical consumption, yield, brightness of end pulp etc should be properly optimized by the technical auditing. Table-1 indicates the benefits occurred by the technical auditing in bleach section.

Table-1
Technical Audit of Bleach Plant

parameters	Before technical audit	After technical audit
Kappa no.	20-30	20-25
Black liquor, m ³	0.5-1	0.1-0.25
Total Cl, %	15-25	10-15
Toxicity in effluent	very high	low

iii) Similarly consistency of the stock at different sections is also very important to conserve the water, energy and chemicals e. g. when refining the stock, the energy into each single fibre by the refining tackle and the surrounding fibres depends on the number of fibres in the refining zone. So, the specific energy consumption will change according to the changes in the consistency of the stock. Another example of the consistency variation is in the variation of basis weight due to variation in consistency in constant level box. Similarly in bleaching section, the bleaching dose is proportional to the flow of fibre into the bleaching tower. A sudden drop in consistency, leads to high chemical consumption and deterioration of pulp quality. Thus the stock consistency at various places need to be properly monitored in the technical audit of the whole mill.

iv) In the paper machine section, off-press dryness and temperature profile of dryers are significantly important for maintaining the quality of paper and reducing energy consumption.

v) Similarly Fig 3 shows the boiler house module for the technical auditing of the boiler house. Proper optimization through control points leads to higher efficiencies of boilers resulting in higher steam generation per ton of fuel.

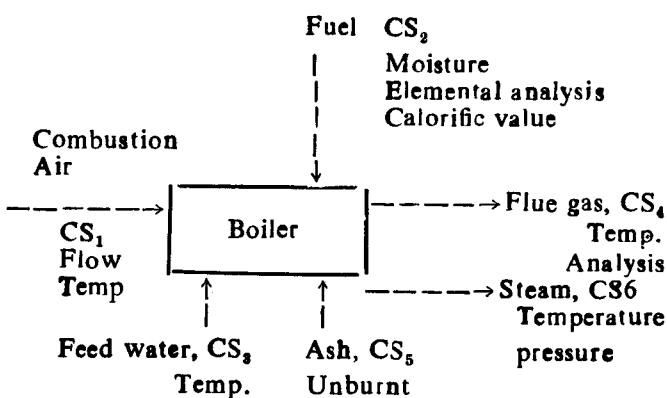


Fig-3 Technical Audit of a Boiler House Section

Table-2 indicates the benefits of technical auditing in boiler house.

Table-2
Technical Audit of Boiler House Section

Parameter	Before audit	After audit
Fuel feeding rate	Irregular	Regular
Excess air, %	30-50	10-15
Feed water temp. °C	N.D.	100-125
Air temp. °C	N.D.	120-150
Flue gas temp. °C	180-200	150-160
CO ₂ in the flue gas, %	8-10	12-13
Steam generation, t/t of BLS	2.2-2.6	3-3.5
Boiler efficiency	low	high

Conclusion :

Technical auditing is a useful tool for stream lining the entire paper manufacturing process keeping in view the optimal use of basic inputs, quality & cost effectiveness of the end product and compliance with environmental regulations. The awareness of the technical auditing of the whole mill should be created in all sizes of the mills. With computer and required software facilities, CPPRI can assist the paper industry in preparing the modules for technical auditing.

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