Ergonomic Work Analysis applied to Water Treatment Plants: integrating knowledge and promoting work conditions and process performance improvements

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1. Reference Program

This paper is on Ergonomic Work Analysis (EWA) experience conducted at Water Treatment Plants (WTP) of Thermoelectric Power Plants (TPP). All cases analyzed here were part of a Ergonomic Corporative Project conducted by a Energy Company in South America.

The project is in charge of the energy company security, environment, energy efficiency and health sector (SEEEH), and the department of production engineering of a Brazilian federal University (NEICT/UFF) has cooperated with the effort.

1.1 Program Methodology

The methodology adopted in each Operating Unit (OU) consists in 4 phases that encompass all stages of EWA, in accordance with the Federal Regulatory Standard No. 17 of the Brazilian Ministry of Labor and Employment.

- 1st phase includes the identification of difficulties faced by workers in various operating and maintenance activities (demands). This phase includes prioritization based on risk and ease of implementing changes related to the demands. A participatory process with workers and company managers select 5 demands to be analyzed.
- 2nd phase covers various stages of EWA and aim to get to a problem diagnosis and its causes. Validation of diagnostic and preliminary ergonomic recommendations is conducted at the end of this phase.
- 3rd phase, details of recommendations are developed and validated with the OU team.
- 4th (final): an action plan for monitoring the recommendations implementation is developed with the OU through a participatory methodology.

1.2 Process Information

Many demands raised during the project have been related to WTP. Water treatment in thermic power plants is critical because it supplies water for various stages of generating process as well as for facilities processes related to human consumption.

There are some levels of water treatment required at different times of the process. The raw water is captured in natural, public or other source and undergoes clarification treatment in order to remove suspended solids. After this the water reach enough quality to replenish losses in the cooling towers, to fire water, to drinking water and other uses. Part of the clarified water can be directed to the demineralization plant that will process this water in order to make it proper for use at the boiler and replenish water losses of thermal cycle (for combined cycle power generation).

2. Demands addressed

Demands such as manual material handling, chemicals hazards, awkward postures in reaching valves, difficulties in viewing process control parameters among others have been found in WTP. These EWA have shown the involvement of different actors both in the problem analysis, as in construction of solutions. These experiences can be listed below:

- The discussion on review of chemical supply contracts terms, changing packaging, frequency and delivery locations, with a positive impact on storage costs, time and risks in material handling;
- Discussion with staff such as engineers, chemists and operators on sampling program improvement, presentation of products (powder x liquid) or even the type of product and dosing process aiming risk and activity time-consuming reducing;
- Discussion with engineering on automation of monitoring, analysis and dosage.

3. Discussion and Results

The comprehensive view of the technical process and the work allowed us to have significant contributions on the process improvement. It is possible to say that this view is partially the result of an EWA methodology, but also the product of the model for implementation of AET adopted in this contract. This model involves the leaders of the unit from the very first moment, when the selection of the demands to be analyzed occurs, to the validation moment for the recommendations to be implemented. After this decision other professionals are then mobilized to support the work situation analysis in order to make it be handled properly. Access to knowledge of various professionals involved in the activity, directly or indirectly, is possible due to the commitment of the main leaders of the unit.

An additional result is the change of many actors perception about the ergonomics concept and the Ergonomic discipline contribution to process improvements. Many actors involved in the process initially tended to have a restricted view of the discipline related mainly to administrative work environment. When EWA progresses to the complex technical processes, in particular the WTP, these professionals end up reconfiguring your vision and manifesting this change in perception through greater receptivity to ergonomics projects.

The results so far have shown that when the application of WEA methodology promotes the interaction of diverse knowledge frameworks in problems analysis and building solutions for improving work conditions not only work conditions can be improved but achieving positive results in process performance prove also be possible. The experience has helped reposition the ergonomics discipline as aligned with the company's global strategies.

References