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Technical Publication

# Improving Boiler Availability

*by*

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*Presented to*  
Committee on Power Generation Association  
of Edison Illuminating Companies  
Atlanta, Georgia  
September 13, 1978

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## IMPROVING BOILER AVAILABILITY

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During the 1976 meeting of this group my predecessor presented his thoughts regarding improving boiler productivity through increased boiler capacity, increased boiler availability, and reduction in forced outages. As a result of that presentation, meetings were held with representatives of Carolina Power & Light Company to investigate the matter further.

The result of the meetings was the development of the Boiler Availability Improvement Program (BAIP) which is an organized plan of approach to increase boiler availability through the cooperation of the participating utility and Riley Stoker Corporation. Through the development period and in the initial working stages, we experienced some interface problems with the program but the lessons were learned and future programs will benefit from the prototype.

We will not go into the reasons why such programs are necessary, as you are all well aware of the historical data regarding boiler availability and the pressures being exerted to increase it to as high a point as practically and economically feasible. The purpose of the program is to identify the root causes of problems encountered in boiler operations and develop solutions to these problems. The intent is to eliminate on a permanent basis the causes of problems rather than applying temporary fixes which have to be repeated periodically at great cost to the utility.

The following is a brief description of the program as it is now being offered to utilities.

### *Phase I — Program Development*

The BAIP for each boiler is individually tailored depending upon the particular requirements of the boiler and the utility involved. It is developed in conjunction with the owner's representatives at both the engineering and plant levels following detailed reviews of the unit's design, operation and maintenance history. The written program contains the following:

- A. Description of the program organization
- B. Delineation of the responsibilities of those involved
- C. Lists of information items that must be recorded and at what intervals
- D. A list of items to be inspected and recommended inspection frequency
- E. Organized inspection procedures
- F. Pre- and post-forced outage data to be collected

The entire program is defined diagrammatically for ease of use by those concerned.

### *Phase II — Performance Analysis*

In order to evaluate the performance of the program and to have a bench mark of unit performance, it is necessary to completely understand the on-line performance of the boiler and its auxiliaries. Under this phase of the program, the following items are performed:

- A. Performance test runs at various loads and under varying conditions to gather operating data
- B. Obtain analyses of fuel and ash
- C. Study ash and slag buildups and log soot-blowing operations
- D. Analyze the data obtained under Items A, B, and C
- E. Compare the data obtained with that obtained when the equipment was first operated
- F. Make recommendations of changes required to bring the unit to optimum performance.

Examples of the items studied in this phase of the program are steam temperatures, metal temperatures, excess air, efficiency, carbon loss, coal fineness, draft losses, and effects of slagging and fouling on unit performance.

### *Phase III — Equipment Inspection*

One of the key phases of the Boiler Availability Improvement Program is a mechanical equipment inspection of the boiler and auxiliaries so that recommendations can be made to put the equipment in first class working order. The equipment inspection consists of the following:

- A. A thorough inspection of all equipment covered by the program by a team of experts, including:
  - Boiler Design Engineer
  - Fuel Burning Engineer
  - Quality Assurance Engineer
  - Construction Superintendent
  - Service Engineer
  - BAIP liaison engineer
- B. Analysis of material samples and non-destructive testing
- C. On-site recommendations, at the conclusion of the inspection, for repairs to be made under emergency and/or temporary conditions

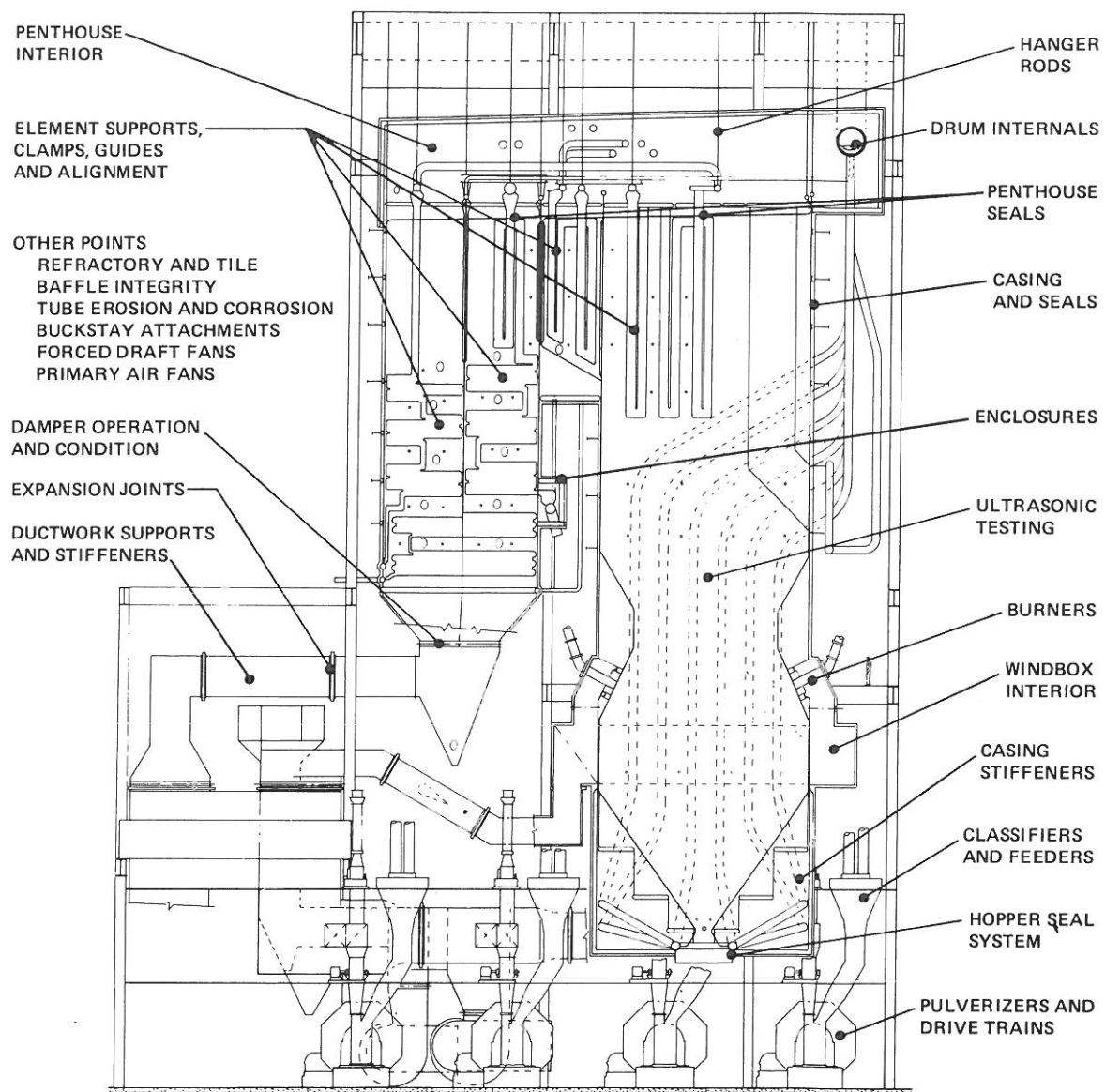


Figure 1

- D. An in-depth written report of the condition of all equipment, including sketches, photographs, ultrasonic test reports, and material analysis findings. The report contains a list of all areas requiring further engineering study to develop improved equipment integrity and a list of items requiring routine maintenance.

Figure 1 is a unit illustration indicating many of the areas various manufacturers have determined from experience to require detailed inspection and reports. The items indicated may be expanded depending upon the unit history. Experience to date indicates that this inspection requires a unit outage of four to six days.

#### *Phase IV — Operations and Maintenance Review*

Operating and maintenance procedures for the boiler are reviewed with the utility staff for compliance with the manufacturer's recommendations. This review is considered in recommending any changes believed appropriate due to deviation from recommended practice, equipment additions or modifications, or changes in the state of the art.

When it is felt necessary, training courses for operations and maintenance procedures will be conducted by Riley personnel.

Following each phase of the program, a meeting is held with the client to review the reports generated and determine further action to be taken as a result of the report findings.

It is the intent that the effort not end following the work done in Phases I through IV but continue so as to achieve the goal of continually increasing unit reliability and availability. The program, as designed, provides that when there is a forced or partial outage, the plant personnel will investigate it in such a manner as to preserve available evidence and have readily available the conditions surrounding the outage. In accordance with the program, the plant personnel will then involve both their engineering department and Riley Stoker Corporation to aid in determining the root cause of the problem and arrive at a permanent solution.

It is our belief that through the use of programs such as the one described above, the electric utility industry will be able to take a large step toward bringing unit availability to the point desired.