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Project Title: Preparation of standard instructions for design, construction and testing of boiler control and protection system

Department:	Upgrading and standardization of monitoring, protection and control systems of power plants plan	Employer:	Niroo Research Institute
Project/Program Manager:	Abbas Yousefpour	Executor:	Ali Bakhshi
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Keywords:

Instructions, standard, design, construction, control, protection, boiler

Project Necessity:

Thermal and combined cycle power plants supply about 70% of the country's electricity and boilers of ordinary type and heat recovery are their main components, so that in terms of performance, the boiler plays a major role in the power plant and is always one of the main axes of designer, builder and operator. In this regard, its control and protection system also has a major role in the power plant control and protection system.

Now, according to the following, the necessity of designing, manufacturing and operating the boiler control and protection system in the country is of special importance:

- 1- Conditions of the control and protection system of the country's boilers, which are generally very old and have lost their efficiency in a way that is generally not in service, and its basic rings, including the fuel and air rings, are operated manually, which in terms of Power plant efficiency and environmental issues are very unfavorable.
- 2- The economic and political conditions of the country have made it very difficult and sometimes impossible to access a new control and protection system or to replace some equipment.
- 3- Existence of appropriate knowledge and capability of the country in the field of design, construction and operation of boiler control and protection system potentially
- 4- Very high economic added value in the design, construction of boiler control and protection systems

5- The importance of localization of parent industry control systems in the country and also the discussion of passive defense in the field of steam power industry

Project Goals:

The following items were used to carry out the project:

- 1- A comprehensive study on the formation of a database of various boilers in the country in terms of control and protection systems
- 2- Careful review of all existing standards such as ISA in the field of design, construction and operation of conventional boiler control and protection system and thermal recovery
- 3- Careful review of all existing standards such as NFBA in the field of design and construction of control system and protection of boiler combustion section of ordinary type and thermal recovery

Considering that the main purpose of this project is to design, build all or part of the control and protection systems of the country's boilers in the first stage and in the next step to do so globally by local experts, it is necessary to find a basic knowledge of The condition of the country's boilers and sufficient mastery of international standards in this field has been inevitable.

Abstract:

To implement the design, construction of boiler control and protection system, the first step is to develop the necessary standard in this field according to valid standards such as ISA, NFBA, etc., and to consider the type and operating conditions of the country's boilers and control systems. Their protection is also the condition of the country in terms of relevant technical knowledge and the level of global technology

The need for this is given more attention in view of the following:

- 1- Boiler operation is at very high pressure and temperature and there is a possibility of explosion, so the issue of safety is very important. Especially considering the conditions of their operation in Iran
- 2- Defects in the boiler control system can lead to trip of the unit and failure of the whole unit, as a result of which the damages resulting from the depreciation of the equipment and the non-functioning of the system will affect the power plant and the electricity industry.
- 3- The main part of the power plant efficiency is determined by the boiler efficiency and the control system has the main role in determining the boiler efficiency.
- 4- The environmental issues of the power plant are mostly affected by the performance of the boiler, and again the control and protection system of the boiler has a fundamental role in this regard.
- 5- If the optimal control and protection system is designed for the boiler, the corrosion of the boiler equipment, including the combustion chamber, can be greatly affected, as a result of which the useful life of the power plant can be extended.

Steps and Methodologies:

The following steps have been considered to develop the necessary standard in this field:

- 1- Studying, reviewing and classifying the types of boilers available in the country (database formation) in terms of: normal and thermal recovery, positive pressure and negative pressure, etc.
- 2- Studying and examining analog control loops such as drum water level, super heater steam temperature, fuel and air, etc. of all types of boilers in the country
- 3- Studying and examining sequential control logics such as starting, stopping, etc. of different types of boilers in the country
- 4- Study and review of protection logics and related parameters such as determining the type and level of protection signals of steam and recovery boilers, interlocks between parameters, logic related to the reservation system and reliability of control loops
- 5 - Study and review of global standards in the control and protection of boiler quantities
- 6- Studying and reviewing the operation points of the boiler proposed in the world-renowned authorities
- 7- Providing the necessary necessities during the operation of the boiler according to the control and protection system of the boiler
- 8- Providing instructions in accordance with international standards and operation needs and the level of technical knowledge of the country in order to design, manufacture and test protection and control systems for various types of boilers.

Main Results (technical outputs, patents, papers, books, reports, etc.):

According to its initial definition, this project has achieved the standard instructions for designing, manufacturing and testing the boiler control and protection system, which are presented in the following documents.

Project Documentation:

- 1- Report on establishing a database and reviewing the types of boilers available in the country
- 2- Study report of analog control loops, sequential control logics and boiler protection
- 3- Review report of standards and operation points
- 4- Report on the compilation of supplies and instructions