

2012 International Conference on Future Electrical Power and Energy Systems

Influence of Plant Steam System on Thermal Economy of Thermal Power Plant and Energy Strategy

Yong Li, Ying-ying Wen

School of Energy Resources and Power Engineering, Northeast Dianli University, Jilin City, China

Abstract

When the unit is under normal operating, the steam source of plant-steam is from the fourth steam extraction of turbine. But at the low load operating condition, during the process that the steam source of plant steam switches to reheat cold section from the fourth steam extraction, steam power capability in the turbine is further reduced. In this paper, in order to improve the economy when the turbine is operating under the low load, reheat cold section steam is used as high-pressure steam to extract the fourth steam by the steam technology, which turns the low-pressure steam into the medium-pressure steam for recycling. This paper, taking 300MW unit as an example, discusses the influence on the thermal economy of unit after putting the steam ejector into the plant steam system of thermal power plant.

© 2012 Published by Elsevier Ltd. Selection and/or peer-review under responsibility of Hainan University.
Open access under [CC BY-NC-ND license](https://creativecommons.org/licenses/by-nc-nd/4.0/).

Keywords: plant steam system; energy-saving; Low load; steam ejector

1. Introduction

In the production process of thermal power plant, In order to ensure that turbine is operating under safety and reliability, the steam source which can meet the demands can be provided at the low load or abnormal conditions, and the steam for production and life can be provided to the relevant auxiliary equipments and facilities, plant steam system for the whole power plant is established [1].

During the normal operation of the unit, the fourth steam extraction of turbine is usually used as steam source of plant steam to directly provide steam to deaerator, air heater and fuel heating, the station heat exchanger. When the unit load decreases, the pressure of the fourth steam extraction cannot satisfy the requirement of plant steam. At this moment, steam source of plant steam must switch to high-pressure cylinder exhaust, as known from article [2]. However, it not only leads to the decrease of the capacity for doing work of turbine, but also to the great loss caused great throttling. What's more, it affects the thermal economy of turbine operating. Therefore, the proper selection of steam source and its combinations for plant steam system has a very positive significance to the dig energy-saving potential of plant and improve the thermal economy of unit operating.

Steam injection technology uses high-pressure steam as a media to inhale and compress low-pressure steam by steam ejector, which makes the low-pressure steam to the medium-pressure steam for recycling. Since this technology consumes certain high-pressure steam and recycles the low-pressure steam, it can

achieve the goal of energy-saving. In recent years, with the increase of consciousness of environmental protection and energy-saving, steam ejector has been widely used in the production and living areas, as known from article [3] and [4]. In this paper, we attempt to apply steam ejector to the plant steam system in thermal power plant, and use steam ejector technology to reach the purpose on energy-saving. Meanwhile, taking 300MW unit as an example, we analyze the economical influence on turbine operating through the calculation of comparison, when steam ejector is used.

2.Plant Steam System of Thermal Power plant

Plant steam system of thermal power plant is established for safe operation and rapid unit commitment. There are many auxiliary steam users in thermal power plant, which need steam for starting process or operating equipments.

When a unit is in start-up stage, steam from adjacent unit under normal operating conditions needs to be introduced into the steam users of this unit (If the first unit starts, steam is provided by the starting-up boiler). Such as preheating water supply in deaerator; heating air heater at boiler tail to improve the temperature sent to air preheater and prevent metal from corrosion and ash clogging; station heat exchanger; turbine shaft seal; ejector of vacuum system; fuel heating and atomization; raw water heating and others.

When the unit is under normal operating conditions, the needs of its auxiliary steam user can be solved. Also the qualified steam can be provided to the adjacent unit which needs it. On the premise of satisfying needs, the normal steam source of auxiliary steam system should use regeneration pumping with low thermal parameters as far as possible. It can increase the capability of regeneration system to do work, and improve the thermal economy of thermal power plant. It should be considered that standby steam source needs to be used when the steam parameters of turbine starting and regeneration pumping can not meet the requirement. Drainage of auxiliary steam generally should be recycled into thermodynamic system except that it can not be recycled or has been seriously polluted.

Fig.1 is the plant steam system of 300MW unit. This system mainly consists of auxiliary steam header, steam conditioning device, drainage pipe, connecting pipe and valves. Steam source of plant steam system usually comes from certain segment of pumping of turbine. Its normal steam source is the fourth steam extraction of turbine. And its standby steam source has cold reheat steam and starting-up boiler. Desalted water is used as the attemperation water. The steam users of this plant steam system have Atomization steam from boiler ignition oil and stability fuel oil at low load, factory heating, shaft seal steam of small steam turbine, shaft seal steam of main steam turbine, boiler air heater, deaerator steam under starting-up or low load conditions, debugging steam of small steam turbine and equipment antifreezing steam, as known from article [5].

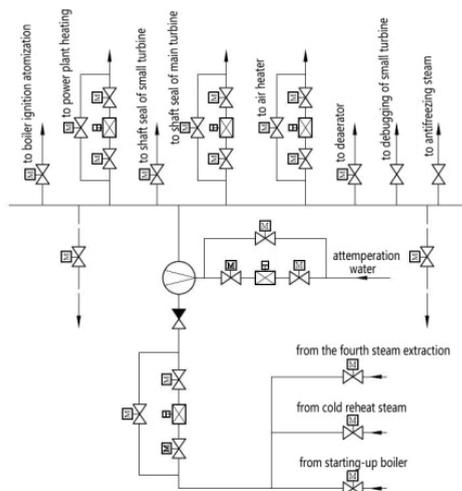


Figure 1. Plant steam system of 300MW unit

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات