

# The WR Tangential Firing System



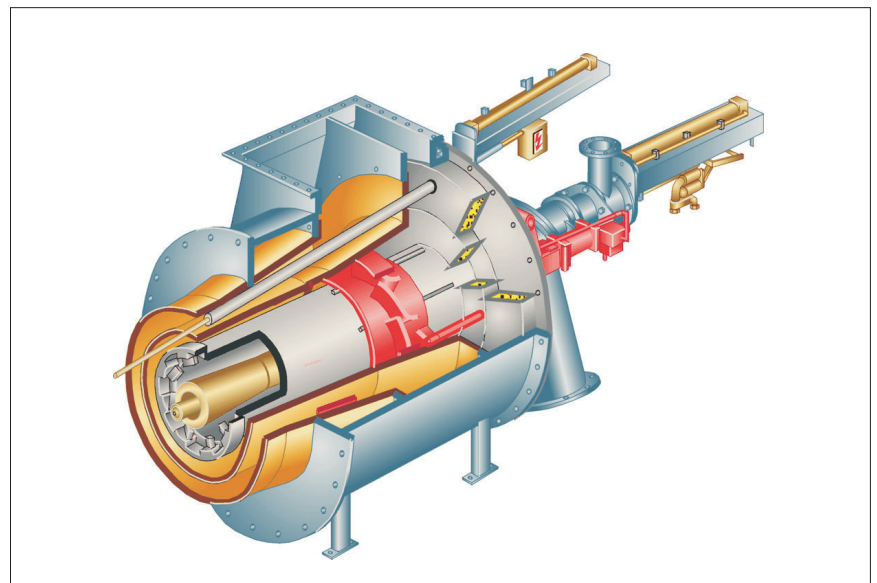
The advanced WR In Furnace Combustion Technology

## T-Firing principle

This unique tangential firing technique, employing circular burners, is now used at the latest ultra super critical boiler units in Denmark. The combustion technique can be applied for hard coal, oil, biomass dust and natural gas in any combination.

The system provides excellent measures in the NO<sub>x</sub> emission abatement where air staging is the main feature. The central vortex in the combustion reactor can be controlled by the burners in operation in a mode which enables low stoichiometry combustion to take place in the furnace centre in the primary combustion zone.

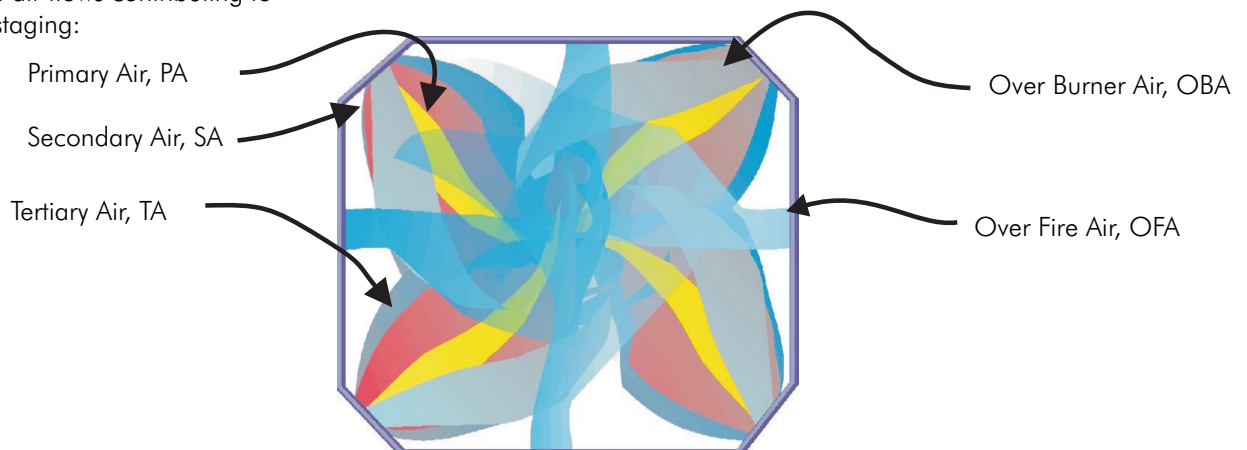
The OBA and TA ensure outer vortex regions at higher stoichiometry levels to protect furnace walls from reducing atmosphere. The T-firing system consists of two main combustion process components; the Wide Range (WR) Low NO<sub>x</sub> burner itself and the furnace combustion reactor in which the burners are integrated parts. The fully developed furnace reactor in the T-firing system will have five different air flows contributing to the air staging:



The WR single burner units are provided with individual air ducts having burner-external control dampers and individual flow measurements

The circular burner has the first three of these air flows. The burner has a turbulator in SA which maintains stable ignition over a wide load and fuel range in combination with a flame holder.

The TA is an axial flow which means that the flame can be kept narrow and long because the TA forms the major part of the air flow through the burner.



The use of circular burners provides an excellent annular air side shroud protection of the sub-stoichiometric part of the flame. The graphic shows a boiler section seen from above. The shading illustrates different oxygen concentrations.



The WR Low NOx burner

## The advanced WR In-Furnace Combustion Technology

The photo below shows the In-Furnace combustion reactor seen from the inside of a typical T-fired BWE Benson boiler. The corners and hopper will be made as one integrated part of the spiral membrane wall, thus forming the corner base for the burners and the OBA system. The OFA system which supplies the last part of the combustion air is placed on the sidewalls above the primary combustion zone.

### Operations, Materials and Service

The burner is designed and proved for reliable operation and easy maintenance with low costs. The heat exposed parts are made of superhigh heat resistant alloys.

### The WR Low NOx Burner

The WR Low NOx burner can be a combined coal/oil/gas/biomass burner

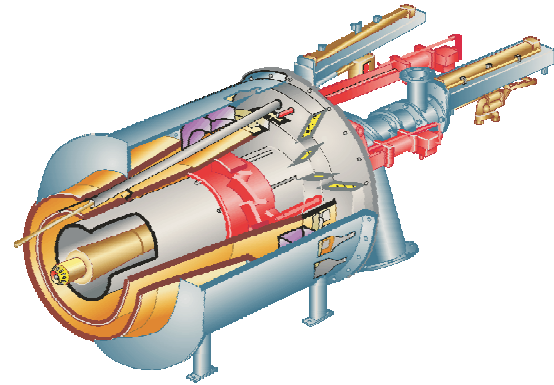
with full thermal capacity on each fuel. The basic design of the WR Low NOx burner features four independent air flows: the primary, the secondary, the tertiary and the core air flow. When burning coal, the primary air flow conveys the pulverised coal to the burner throat. The flame holder mounted at the end of the inner coal pipe maintains the attached Low NOx coal flame. The burners can be fitted as individual burners as well as in windbox arrangements. The firing configuration is adapted to each individual boiler. The burners have been supplied in capacities from 20MW<sub>thermal</sub> to 85 MW<sub>thermal</sub> per burner.

More than 500 burners of the WR type have been supplied. The combustion technique has been developed during the last 50 years within the utility business and today it represents the absolute state-of-the-art within combustion technology.

Today it forms the basis for several retrofits as well as four very recent Ultra Super Critical Boilers in Denmark of which the latest is the Avedøre Unit 2.

A 450 MWel T- fired boiler is being erected, the lowest levels of burners not yet mounted.

The spiral pipes of the once through supercritical boiler are seen in the outlet of the furnace hopper section.



The WR Burner in its windbox design. The burner can be delivered for triple fuel firing as shown.

### World leader in steam power technology

Burmeister & Wain Energy A/S has specialized in the development and design of advanced steam boiler plants for utility and biomass fired power stations.

Furthermore, BWE designs a wide range of auxiliary power station equipment such as the BWE Low-NOx coal/oil/N-gas/biomass burners, Air Preheaters and Gas-Gas Heaters.

BWE is part of the Italian STF S.p.A. Group.

BURMEISTER & WAIN ENERGY A/S  
Lundtoftøgårdsvej 93A  
DK-2800 Kgs. Lyngby, Denmark  
Tel. +45 39 45 20 00  
Fax. +45 39 45 20 05  
E-mail: [info@bwe.dk](mailto:info@bwe.dk)  
[Http://www.bwe.dk](http://www.bwe.dk)

