

CASE STUDY:  
**WEST  
BURTON  
POWER  
STATION**  
UK



UNIT OUTPUT IS INCREASED BY 20MW ON EACH OF THE FOUR 500MW UNITS



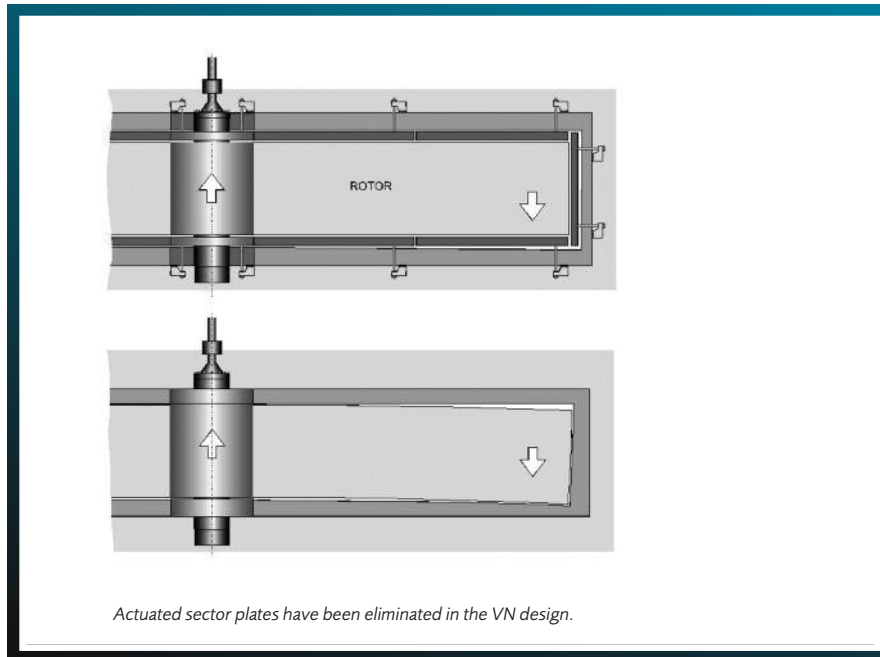
MODIFICATION TO INCORPORATE THE HOWDEN VN SEALING SYSTEM HALVED THE AIR LEAKAGE ON THE AIR PREHEATERS, WHICH PERMITTED THE STATION TO GENERATE AN ADDITIONAL 20MW FROM EACH OF THE FOUR UNITS UNDER CERTAIN OPERATING CONDITIONS. RECENT PERFORMANCE TESTS HAVE PROVEN THAT THE SEALING SYSTEM HAS OPERATED SATISFACTORILY FOR 15 YEARS.

WEST BURTON IS A 2000MW COAL FIRED STATION SITUATED IN THE MIDLANDS OF ENGLAND, WHICH WAS COMMISSIONED IN 1967. EACH OF THE FOUR UNITS IS FITTED WITH TWO MAIN AND TWO MILL ROTARY REGENERATIVE HEAT EXCHANGERS THAT PREHEAT THE SECONDARY AND PRIMARY AIR RESPECTIVELY. A GRADUAL INCREASE IN AIR LEAKAGE THROUGH THE MILL HEATER HAD REDUCED THE FLOW OF AIR TO THE COAL MILLS AND THIS HAD REDUCED THEIR CAPACITY TO EFFECTIVELY DRY AND TRANSPORT THE PULVERISED FUEL TO THE BURNERS.

Similar difficulties on the main air preheaters meant that the combined flow of flue gas plus air leakage eventually exceeded the maximum capacity of the induced draught fans, which reduced their capacity to remove gas from the boiler. By 1978 the average output from each unit was 20MW below the nominal 500MW rating.

Inspection by Howden engineers identified the moving seals at the hot end of the rotor as the main source of increased leakage. These had been intended to compensate for downward deflection of the rotor as boiler load increased. In addition, the seals behind the adjustable axial sector plates had deteriorated, further increasing the leakage.

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Basic Data	Before	After	3 years later
Main heaters Air leakage	8.4%	4.3%	5.3%
Mill heaters Air leakage	35%	7.3%	18.5%
Unit output	480MW	500MW	500MW

It was decided that, over a four-year programme, the heaters would be converted to the Howden VN design. This involved firstly eliminating seals that could be adjusted while the boiler was online, and secondly doubling the number of radial and axial seals on the rotors.

Before the modifications, typical leakage in the main air preheaters had been greater than 8%. This was reduced to 4.3%. Similarly, leakage in the mill heaters, (which had a higher pressure differential over their seals than the main heaters), was reduced from 35% to just over 17%. This permitted the electrical output from each unit to increase by 20MW to the design value of 500MW. After three years operation performance tests were carried out on the air preheaters.

This showed only a nominal increase in air leakage (see data box) and the units were maintaining output. Furthermore, the station confirmed in 1995 that performance of the air preheaters continued to be satisfactory.

**BEFORE THE MODIFICATIONS, TYPICAL LEAKAGE IN THE MAIN AIR PREHEATERS HAD BEEN GREATER THAN 8%. THIS WAS REDUCED TO 4.3%.**

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