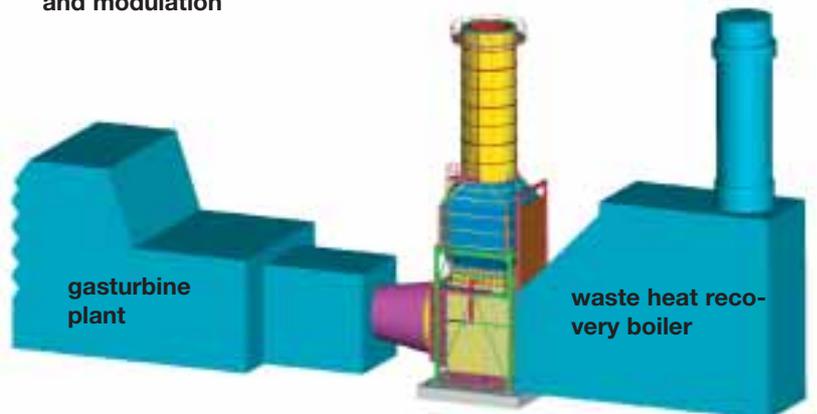
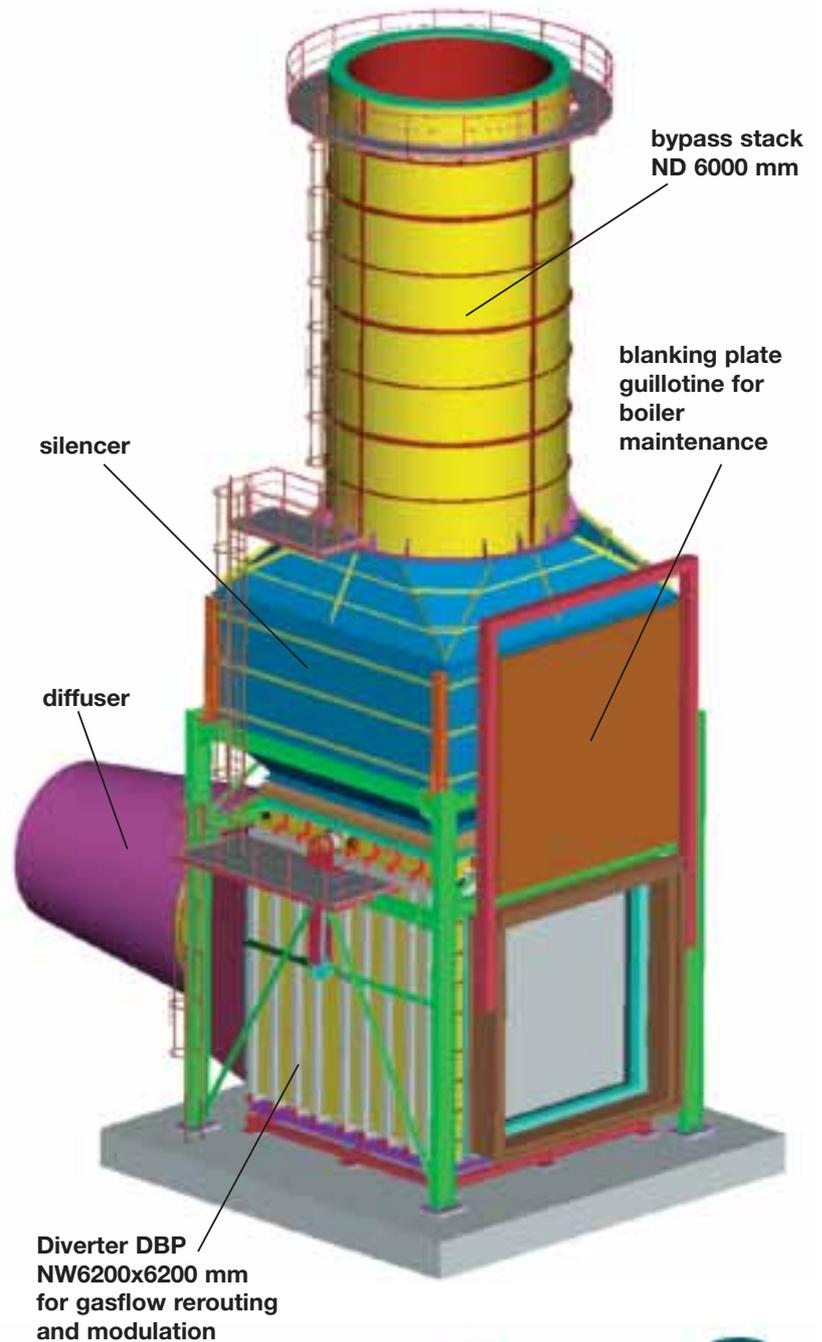




## Bypass system for combined cycle gasturbine plant based upon a new, patented diverter

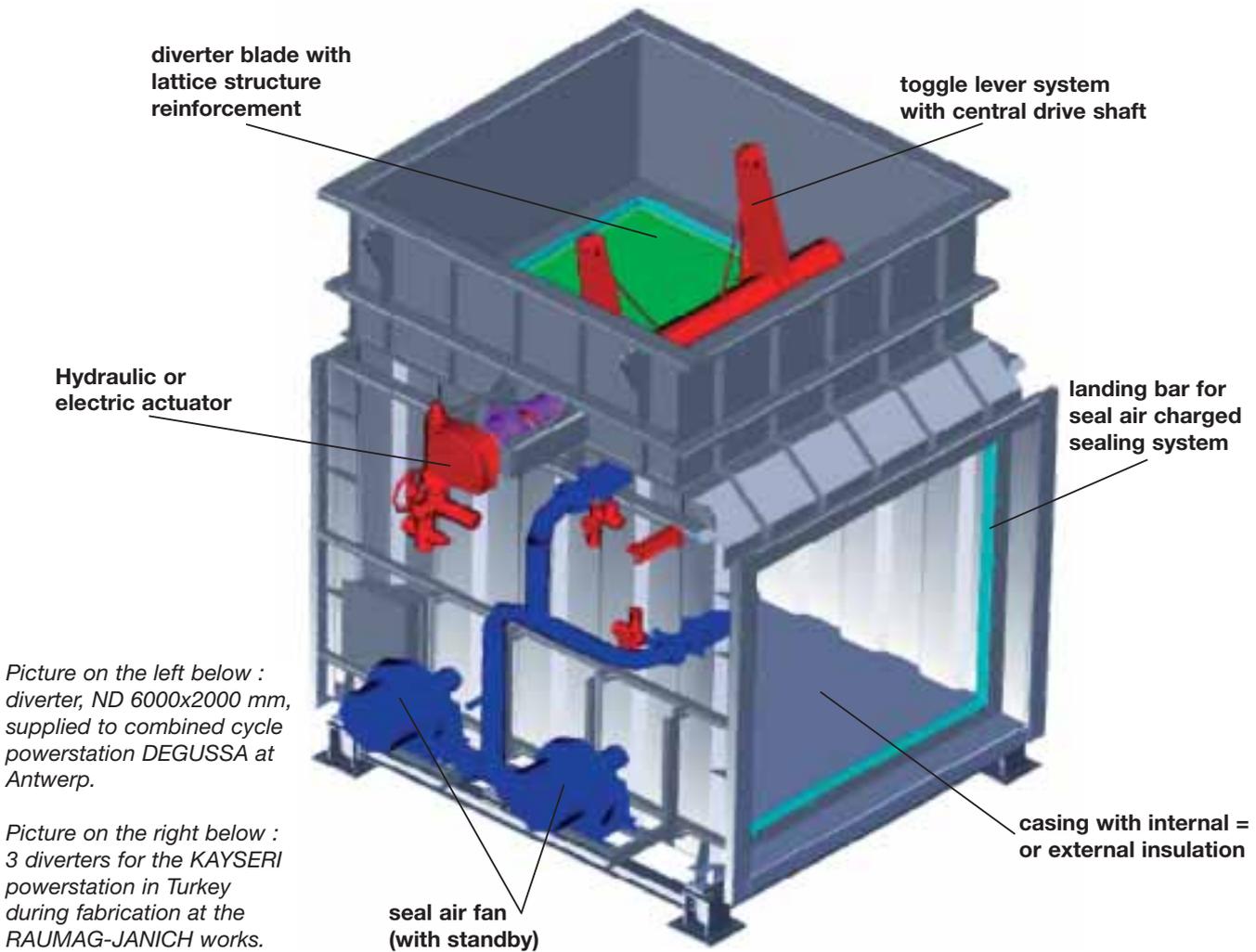
**RAUMAG-JANICH** has developed a complete bypass system for gasturbine plants. Basis of the system is the proven diverter with its patented, lattice structure reinforced damper blade, as well as the patented, highly resilient **NICROFLEX-HIPERFORM** sealing system. The total height of the depicted bypass system measures approx. 30 m. All parts are provided with internal insulation. The dimensions of all system components can be adapted to suit different gasturbine frame sizes. The diverter itself may be electrically or hydraulically operated. During turbine start up the diverter may be utilized for volume control operations towards the boiler. With double seal and seal air injection a 100% gastight, man safe isolation is achieved. If requested, an additional blanking plate guillotine may be supplied.



# Diverter with internal toggle lever or pivot lever actuation

Large diverters are usually designed with an internal toggle lever drive mechanism. Of advantage is that the actuation forces act in the blade centre and are hence evenly distributed throughout the blade structure. Also, in the end positions, when the blade is subjected to maximum pressure differentials and its seals are making contact with the landing bars, the toggle lever system provides for an effective conversion of torque into very high closing forces.

Smaller diverters however, can be operated through a direct driven, pivoting shaft. The blade may be equipped with either single or double sided thermal insulation in order to reduce heat transmission into the closed off section. The blade can be electrically or hydraulically powered. During plant start up volume control and gas flow modulation is possible. The kinematics of the toggle lever system in fact improve the modulation characteristics of the blade.



Picture on the left below : diverter, ND 6000x2000 mm, supplied to combined cycle powerstation DEGUSSA at Antwerp.

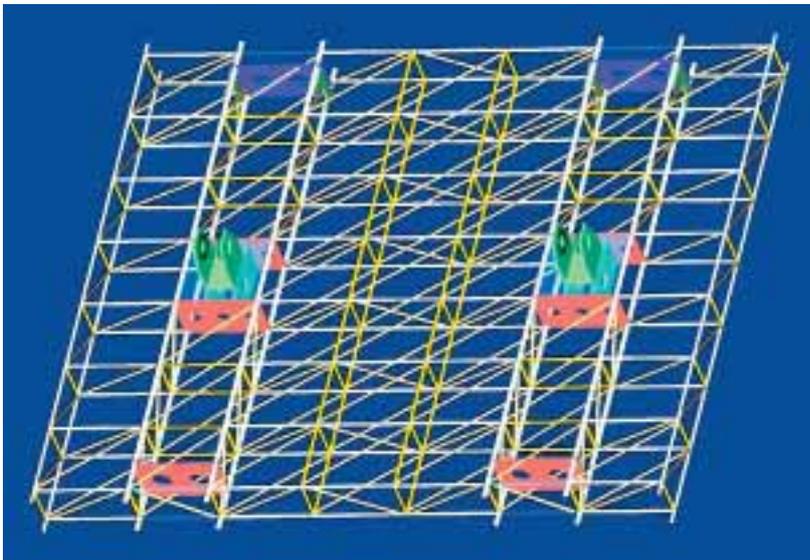
Picture on the right below : 3 diverters for the KAYSERI powerstation in Turkey during fabrication at the RAUMAG-JANICH works.



# The patented, lattice structure reinforced blade prevents heat distortions

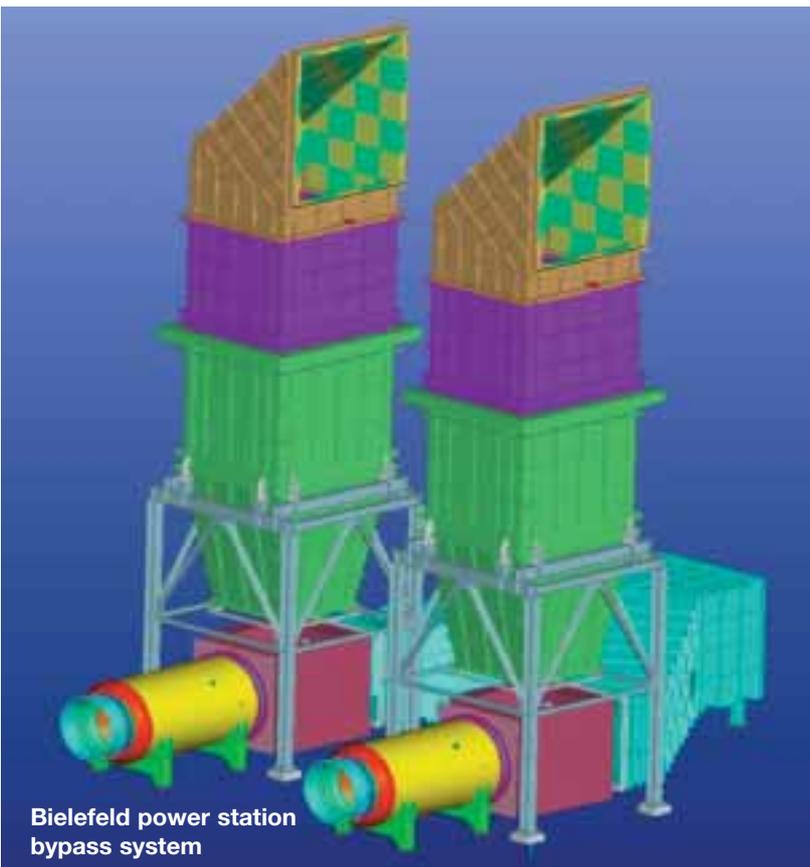
**RAUMAG-JANICH** has developed and patented a new diverter blade design for gasturbine combined cycle plant service. Generally, however, the design is eminently suitable for all high temperature service conditions. It has already proved itself in several different applications. By means of computer simulation the behaviour of the blade under particular service conditions is exactly predictable in advance.

Together with the also new **NICROFLEX-HIPERFORM** sealing system, notable for its great resilience and stability when subjected to high gas velocities, this design is an advantageous solution for even the largest damper dimensions. Please refer also to our publications "**TECHNOLOGY 3** and **6**".



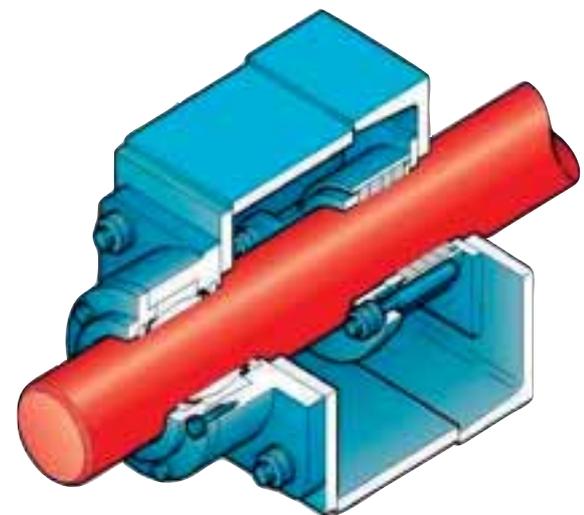
The schematic illustration depicts the lattice support structure of a high temperature diverter blade. The blade's cover plates are floatingly and cardanically attached upon this structure. This prevents their distortion when exposed to uneven heating up.

High temperature gas can flow freely through the lattice support structure. All its members heat up evenly and maintain a uniform temperature profile despite the fact that changes of gas temperature can occur very rapidly. Any deformation of the blade is thus positively avoided.



**Bielefeld power station bypass system**

## Bearing support of the main drive shaft



The main drive shaft is supported by maintenance free spherical sleeve bearings fitted into dust tight housings. Neither the exhaust gas nor the environment can harm those bearings. The large, specially coated spherical bearing surfaces ensure a smooth movement of the bearing irrespective of vibrations. The passages of the shaft through the diverter casing are sealed by packing glands with internal support ring.

# The new, patented sealing system NICROFLEX-HIPERFORM – great resilience and stability



**RAUMAG-JANICH** has developed the new NICROFLEX-HIPERFORM, DBPa, sealing system for shut – off and modulating dampers, more specifically however, for combined cycle gasturbine diverters. The tubular sealing elements (illustrations 1, 2 and 3 ) are made of a certain stainless steel and thus feature a very high resilience.

In their standard configuration they accept deformations of up to 30 mm. Point loads caused by tramp material are also readily absorbed and contact with the landing bar is regained within short distances.

The internal, vee – shaped back up bar, stabilizes the sealing element in uncompressed condition and ensures that it can withstand vibrations caused by high gas velocities or turbulences, while operating in the modulating mode. With a single sealing arrangement (single sealing plane) an area equivalent tightness of 99,98% is achieved. Dampers with two sealing planes and seal air injection provide a 100% gastight, man safe shut – off.

Illustration 3 depicts a new, also patented seal arrangement by means of which a 100% gastight shut – off can be achieved with only one sealing element.

In compressed condition, e.g. damper closed, the seal flattens and bulges outwards, thereby creating a broad area of contact able to accommodate two sealing surfaces. Gas leakage is prevented as usual by seal air injection. Please refer also to our publication “**TECHNOLOGY 4**”.

*The photos depict a diverter damper with internal insulation, the blade featuring the patented lattice type support structure with insulation and double seal.*



## RAUMAG-JANICH – perfect Technique, Quality and Security