

VARIABLE PITCH AXIAL FANS ROTARY AIR PREHEATER (RAPH) AFTER MARKET SERVICES SPARES & RETROFIT



Variable Pitch Controlled Axial Fans



RAPH



HAZIRA MANUFACTURING FACILITY

CONTACT

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Larsen & Toubro and Howden establish Joint Venture for Axial Fans and Air-Heaters business in India

The joint venture agreement was signed by Mr. Ravi Uppal, MD & CEO, L&T Power, and Mr. Bob Cleland, CEO - Howden Global, in Mumbai on May 04, 2010 in the presence of the Mr. A.M. Naik, Chairman & Managing Director, Larsen & Toubro.



SCOPE OF JOINT VENTURE

Larsen & Toubro (L&T) and Howden have signed a Joint Venture (JV) to design, engineer, manufacture and supply axial fans and air pre-heaters to Indian thermal power plants ranging between 100 MW to 1200 MW. These products form vital components of energy efficient thermal power plants.

**L&T
Howden**

Thermal Power Plants

Rating from 100 to 1200 MW

Axial Fans and Air Preheater

Exclusive Marketing Rights for
supply of Spares and Retrofit

Customer Base



A Maharatna Company



MANUFACTURING FACILITY AT HAZIRA, GUJARAT

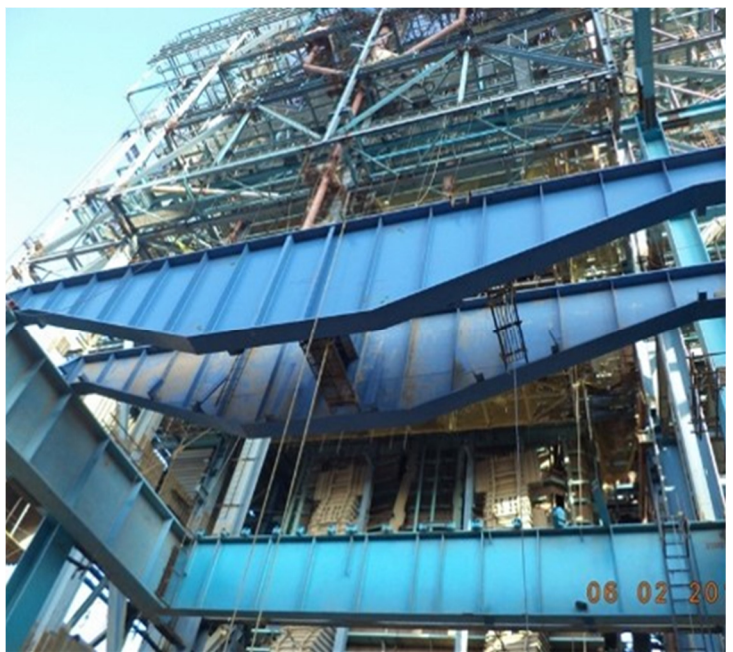
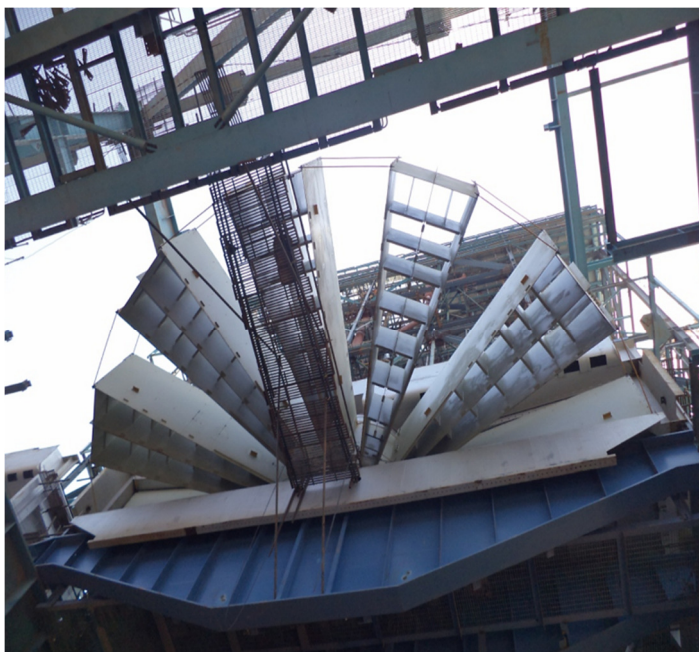
Largest Fan Testing Facility in India having 3.5 MW Motor

HIGHLIGHTS

- FACILITY BUILT UP AREA OF 3500 M².
- 2 X ROLL FORMING LINES; SET OF MACHINES FOR DIFFERENT ELEMENT PROFILES
- EQUIPMENT - ENGINEERED AND SUPPLIED BY HOWDEN, SPAIN
- LARGEST FACILITY IN INDIA HAVING 3.5 MW MOTOR FOR FULL SCALE FAN PERFORMANCE TESTING



SITE INSTALLATION



REFERENCE LIST

	Client	Project/ Power Plant	Location	Nos	MWe	Equipment Supplied	Order Year	Commissioned Year
VARIAX AXIAL FAN								
1	L&T -MHI Boilers Pvt Limited	MahaGenco -Koradi	Koradi , Nagpur	3	660	FD, PA & ID Fans- 6 Each	2011	2015
2	L&T -MHI Boilers Pvt Limited	NPL, Rajpura TPP	Rajpura , Punjab	2	700	FD, PA & ID Fans- 4 Each	2011	2014
3	Doosan Power Systems India	NTPC - Kudgi Super TPP	Kudgi ,Karnataka	3	800	FD, PA & ID Fans- 6 Each	2012	Unit 1& 2: 2017 Unit 3: To be commissioned
4	L&T -MHI Boilers Pvt Limited	RRVUNL - Chhabra	Chhabra, Rajasthan	2	660	FD, PA & ID Fans- 4 Each	2013	Unit 1: 2017 Unit 2: To be commissioned
5	Doosan Power Systems India	NTPC - Lara Super TPP	Lara, Chhattisgarh	2	800	FD, PA & ID Fans- 4 Each	2014	To be commissioned
6	Alstom India Limited	NTPC - Vindhyachal WFGD	Vindhyachal, Madhya Pradesh	1	500	2 - Booster Fan	2014	
7	L&T -MHI Boilers Pvt Limited	MPPGCL-Malwa	Malwa, M.P	2	660	FD, PA & ID Fans- 4 Each	2015	
8	L&T -MHI Boilers Pvt Limited	NTPC-Tanda	Tanda, U.P	2	660	FD, PA & ID Fans- 4 Each	2015	
9	L&T -MHI Boilers Pvt Limited	NTPC-Khargone	Khargone, M.P	2	660	FD, PA & ID Fans- 4 Each	2016	
RAPH								
1	L&T -MHI Boilers Pvt Limited	MahaGenco -Koradi	Koradi , Nagpur	3	660	6 - RAPH (Tri-sector)	2011	2015
2	L&T -MHI Boilers Pvt Limited	NPL, Rajpura TPP	Rajpura , Punjab	2	700	4 - RAPH (Tri-sector)	2011	2014
3	Isgec Heavy Engineering	OPG Power Unit IV	Gummidipondi, Tamilnadu	1	171	2 - RAPH (Tri-Sector)	2012	2014
4	L&T -MHI Boilers Pvt Limited	RRVUNL - Chhabra	Chhabra, Rajasthan	2	660	4 - RAPH (Tri-Sector)	2013	Unit 1: 2017 Unit 2: To be commissioned
5	L&T -MHI Boilers Pvt Limited	MPPGCL-Malwa	Malwa, M.P	2	660	4-RAPH (Tri-Sector)	2015	To be commissioned
6	L&T -MHI Boilers Pvt Limited	NTPC-Tanda	Tanda, U.P	2	660	4-RAPH (Tri-Sector)	2015	
7	L&T -MHI Boilers Pvt Limited	NTPC-Khargone	Khargone, M.P	2	660	4-RAPH (Tri-Sector)	2016	

AFM Solutions

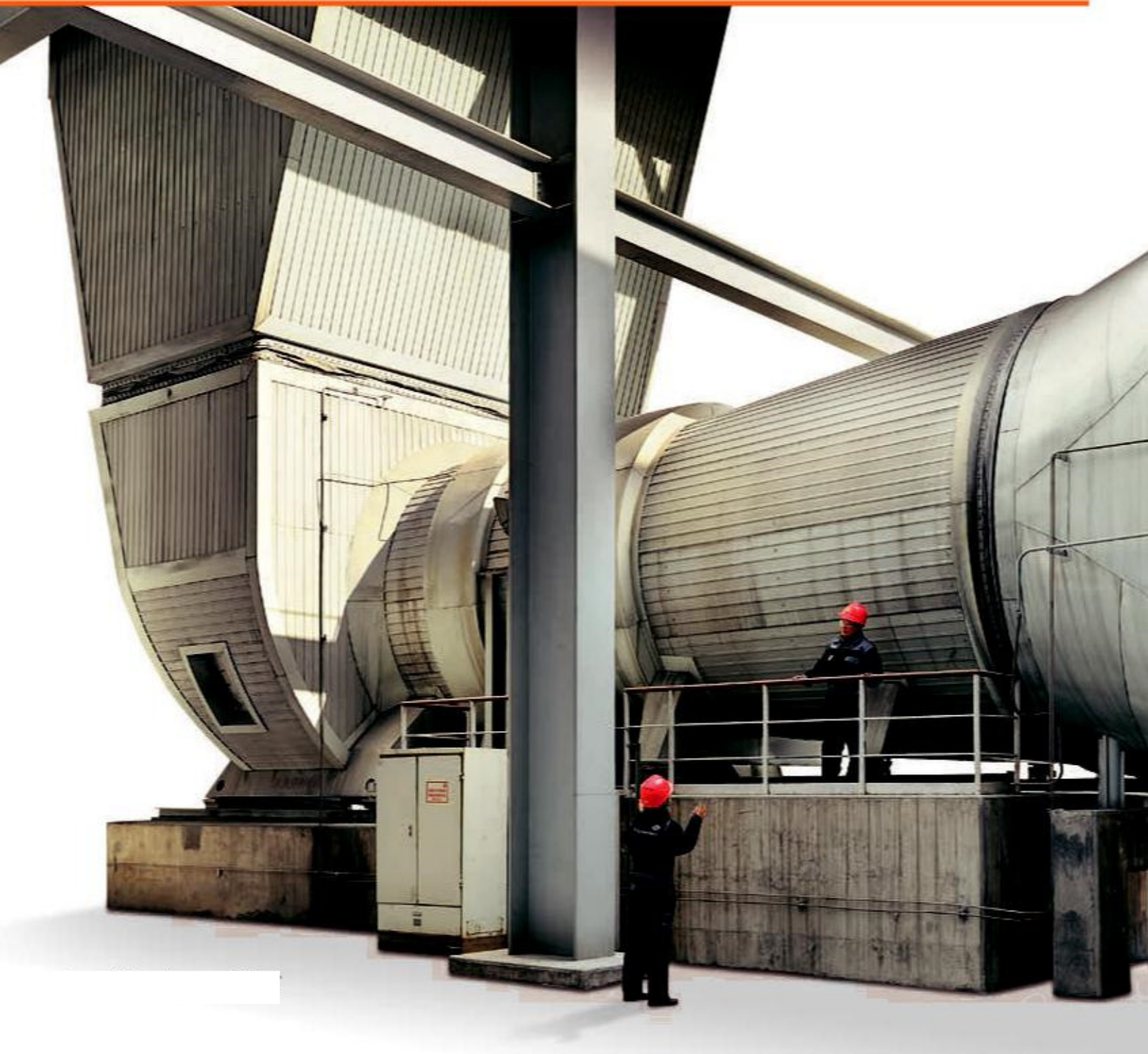
Providing Indigenous Solution for components as per 'Make in India' Initiative by GOI

After Market Services, Spares & Retrofit of Axial Fans of Various Designs i.e Variax, PF, TLT, Novenco, KK&K

Efficiency Enhancement of APH. After Market Services, Spares & Retrofit of RAPH of various Make.

TA Supervisory Services

Aftermarket services, Spares and retrofit for Variable Pitch Axial Fans



Your choice of axial flow fan equipment is a significant investment.

Only L&T Howden spares, services and retrofit can ensure you get the most from it.



For over 160 years our JV partner Howden has been supplying innovative products to key industries where performance and reliability are paramount. Throughout the world, there is Howden equipment underpinning everyday life. It is used in steel mills and coal mines, in electricity generation and in the petrochemical industry. We are world leaders in heavy fan technology and rotary heat exchangers.

We have a reputation for high quality, integrity and absolute dependability, crucial in our areas of operation.

Our JV Partner Howden' Axial Fans is the global centre of excellence for variable pitch axial flow fans. Since the middle of the last century it has been pushing back the boundaries of axial flow design from its technology centre in Denmark, Sweden and Germany

Every fan we supply comes with a lifetime commitment to expert support. Not only can we keep your VARIAX® or PF -fan running to specification over many decades, we can introduce upgrades and enhancements that enable it to benefit from recent technological developments, or adapt it to meet new operating conditions. L& T Howden also offers spares, services and retrofit solutions to variable pitch axial fans from other OEM fan suppliers

RETROFIT SOLUTION AVAILABLE WITH I&T HOWDEN

Change of performance

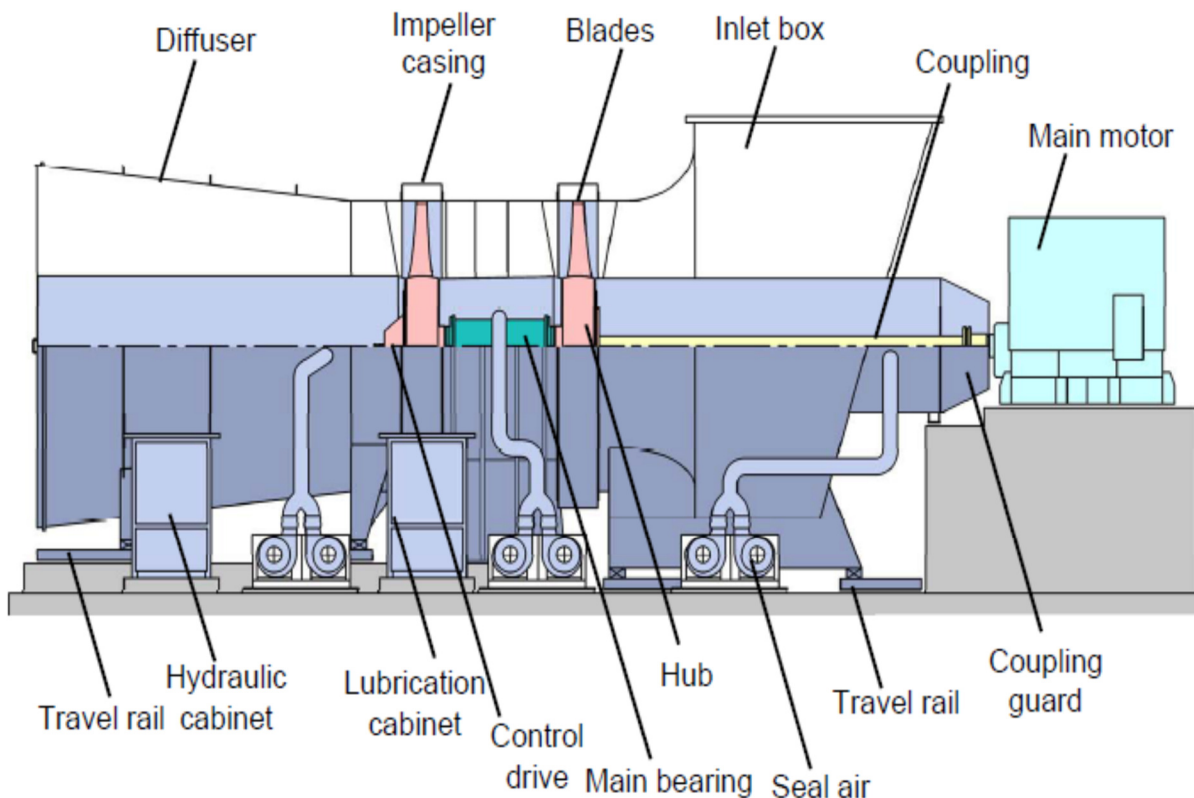
- New blades/existing hub
- New blades and new hub
- New hub size
- New impeller diameter
- New fan speed
- ½ number of blades
- Single stage to two stage
- Improved inlet box
- Improved inlet/outlet before/after fan
- Cover plate for blade screws
- New fan on existing foundation
- New main motor

Life extension

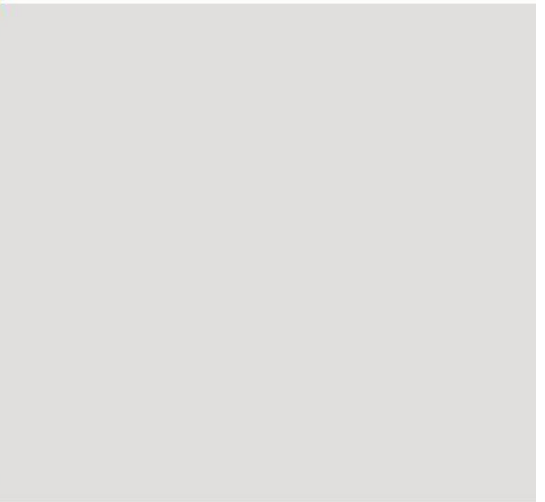
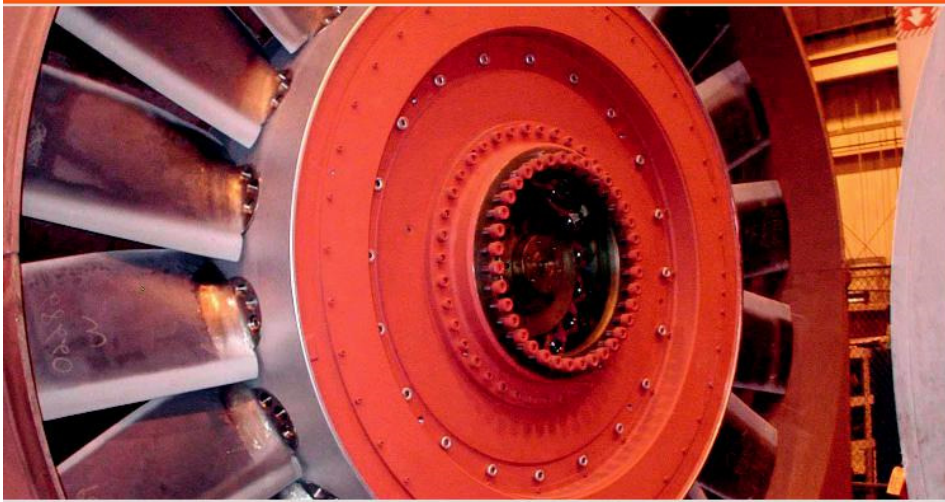
- From grease to oil lubricated blade bearings
- Blades (material, coating)
- Mechanical to hydraulic regulation
- Seal Air
- Upgrade of MBA
- Upgrade of coupling
- Deflector cone

New or upgrade of existing features

- Stall protection
- Updated instrumentation (temp., vibration, speed sensor, etc.)
- Brake



Extend the lifetime of your TLT fan



Our JV partner Howden's acquisition of TLT-Babcock has further expanded our range of offerings, and we now have a suite of aftermarket parts and services for TLT axial fans which will help you optimize performance, reduce downtime and extend the life of your fan.

Spares for TLT axial fans

Our spares for TLT axial fans meet the exact specification, tolerances and performance of the original components.

With the extensive experience of Howden Axial Fans we can assist you as a reliable partner with engineering, spares, services, rebuilds and upgrades.

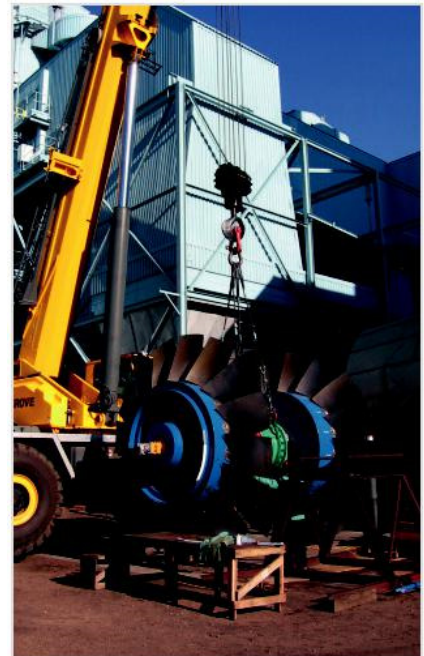
From your initial enquiry to packing and shipping, every stage of our spare parts service is carried out by highly knowledgeable staff. Not only do they make absolutely sure that the replacement part we provide is right in every respect, they will search for any new technologies and developments that may improve the performance of your individual installation. This may be an improved version of the requested part, or an upgrade that could be economically applied at the same time.

Service that optimize performance

The best level of service is the one that keeps your fan available, optimises its performance, reduces downtime and extends the life of the equipment. The best way of achieving this is to work in partnership with us. A service package is the best way to avoid expensive unplanned downtime an unsatisfactory compromise.

Our service package options include:

- Regular inspection and maintenance
- Preventive maintenance and system diagnosis
- Upgrade and optimisation of performance
- Troubleshooting
- Noise reduction
- On-site testing and balancing
- Training
- Spare and replacement parts
- Reconditioning of moving parts





Service network

Our team can draw on the vast resources of Howden global engineering and service network that includes specialists who can advise on aerodynamics, construction, noise reduction, stress analysis and mechanical engineering.

We offer a range of services

- Hub renovation
- Main bearing assembly renovation
- Hydraulic cylinder renovation
- Functional test and/or 8 hour running test of Main bearing Assembly
- Balancing of rotor and/or hub

We always supply an inspection report prior to any renovation work being done and you will also get a full service report of the services performed.

Retrofit is the fast, economic route to enhanced performance.

Many fans have now passed their original design life, and rising maintenance and operational costs and failure rates can be expected.

Our comprehensive and flexible retrofit service enables us to replace critical parts of your TLT installation, no matter how old it is or where it is located, with the most up-to-date upgrades.

This brings you the superior aerodynamics, low dynamic forces and minimal vibration levels of state-of-the-art axial fan technology without the capital investment or downtime of installing a new fan.

Benefits of our retrofit solutions:

- Improved availability and reliability
- Increased pressure
- Improved fan efficiency
- Greater flow volume
- Improved operational safety
- Reduced CO2 emissions
- Reduced power consumption
- Extended equipment life
- Longer intervals between servicing
- Reduced maintenance costs

Retrofit solutions will give the performance of a new fan at a far lower cost than a full fan replacement and you will get a reduction in power consumption.

We believe it makes ecological as well as financial sense to retain the parts of the installation that do not have to be replaced, while raising the performance and efficiency to new levels. When fans are getting older, retrofit is the right route to take.

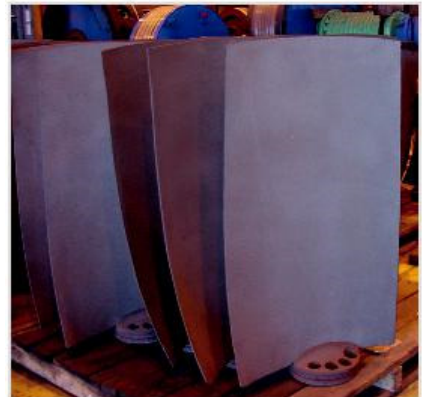
Approved by international authorities

Our products and practices are fully approved by independent international standards authorities.

Our quality assurance procedures meet or exceed the criteria of ISO 9001.

Axial fan brands which we support with spares and services worldwide:

- VARIAX®
- PF
- Shenyang
- Novenco
- Voith Fans
- TLT



Aftermarket Service, Spares & Retrofit for Rotary Air Preheater



Revolving Around You™

Rotary heater upgrade or enhancement is usually the most cost effective way to improve existing boiler performance.



Continuous product development enables us to improve the performance not only of our own equipment but also that of other manufacturers. Our upgrade and retrofit proposals draw on state-of-the-art technology to bring your existing equipment up to the performance level of a new unit.

Revolving Around You™



Upgrading air preheaters to the latest technology standards brings a wide range of benefits:

Leakage reduction reduces the power demands of the fans and reduces the onward flow rate to the gas cleaning equipment increasing its performance.

Optimising the heat transfer element profile and height can improve overall performance significantly.

It is common for plant operating conditions to change over the years. Changes such as the type and composition of the fuel or additional emissions reduction equipment can have a significant effect on optimum heater operation.

Common issues for regenerative heaters include:

- **Fouling**
- **Corrosion**
- **Increasing leakage over time (leakage drift)**
- **Efficiency**
- **Fire risk.**

Rotary heater upgrade or enhancement is usually the most cost effective way to improve existing boiler performance. L&T Howden's program of continuous product development enables us to improve the performance not only of our own equipment but also that of other manufacturers. Our upgrade and retrofit proposals draw on state-of-the-art technology to bring your existing equipment up to the performance level of a new unit. With the widespread focus on environmental

impact and equipment efficiency, L&T Howden is the right partner to support the operators from specification to project management and execution of upgrade and life extension projects.

Engineering solutions

Air preheaters play an integral part in the efficient operation of power plants. Dramatic results can be achieved by either increasing thermal performance or reducing or controlling both the heater fouling and leakage.

Our customized engineering software allows us to model either rotating or stationary matrix designs of rotary regenerative heat exchangers. We can accurately predict the behaviour of the equipment and offer solutions that lower your operational costs with an improved reliability. To recommend an optimum performance it is fundamental to understand the exact behaviour of the equipment.

Our engineering capabilities enable us to recommend the best retrofit, upgrade, refurbishment or enhancement which is the proven route to:

- **Improved efficiency**
- **Greater reliability**
- **Higher availability**
- **Reduced operational costs**
- **Optimised performance.**

Testing capabilities

Since the 1920's our JV Partner Howden Research & Development have always pioneered and refined the key part of the heat exchanger, the heat transfer elements. Testing of element developments, has and still is, carried out on our heat transfer test rig to establish their heat transfer and pressure drop characteristics.



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