



# Thermocompressor Systems

Boost steam to boost profits

For over six decades, Forbes Marshall has been building steam engineering and control instrumentation solutions that work for process industry. Today we have evolved into a leader in process efficiency and energy conservation through technology tie-ups and focused investments in manufacturing and research. Our joint ventures with the world's leading names enable us to deliver quality solutions in 14 countries. Forbes Marshall is probably the only company in the world to have extensive expertise in both steam and control instrumentation. The dual expertise has allowed us to engineer industry specific systems that focus on energy efficiency and utilities management for sectors as diverse as textiles, food processing, paper, power and chemicals.

We have also been adjudged one of India's top "25 Best Places to work - 2008" by Economic Times and the Great Places to Work Institute. Our teams are peopled by some of the finest engineers in the land. These highly trained professionals have developed innovative solutions and saved millions of rupees in process costs for our clients. Our business practices and processes have combined into a singular philosophy of being trusted partners who provide innovative solutions. It's a philosophy we are proud to live up to.

For decades, we have been designing, manufacturing and supplying steam engineering products and solutions to customers worldwide. Our experience in this area is the benchmark against which all others are compared. While our oldest joint venture is with Spirax Sarco, the world leader in steam engineering, our newest joint venture is with Vyncke Energietechnik, the world leaders in converting biomass into energy.

## Compress your steam cost

Rising energy costs and increasing competition are forcing process industries all over the world to slash energy costs and optimize energy consumption. Effective utilization of thermal energy in the form of steam will contribute substantially to this effort. With over sixty years of energy management experience, especially in steam and condensate systems, Forbes Marshall now brings to you a technology that will make a direct impact on your bottom line.

We introduce the Forbes Marshall thermocompressor, a product of comprehensive and meticulous research and experimentation, combined with extensive process knowledge. Thermocompressor technology will enable low grade steam or flash steam to be converted into "useful" steam that can be put back in the process.

Thermocompressor systems will directly contribute to reducing fuel consumption of your steam plant. Typical steam savings range from 15-20% of your current steam consumption.

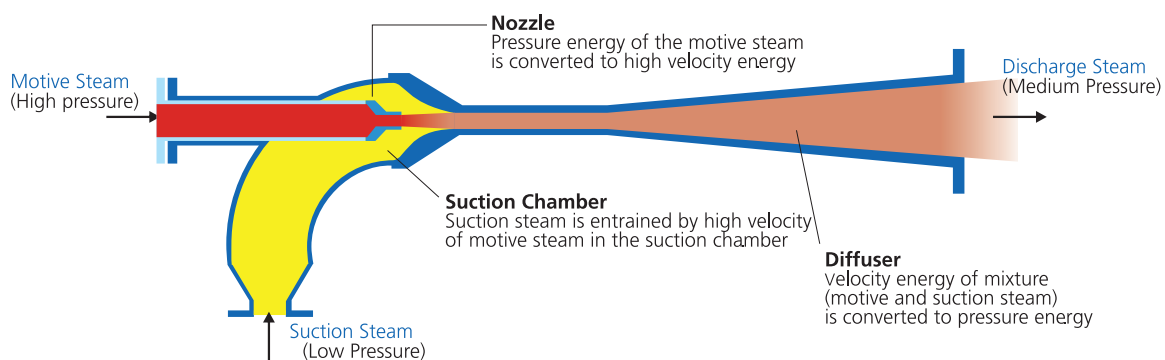
## Boost Your Bottomline

A 50 TPD paper mill near Pune consumed on an average 2.8 kg of steam / kg of paper. After implementing a Thermocompressor system on their Multi-grammage paper m/c, the specific steam consumption dropped to 2.1 kg / kg of paper. This saved them Rs. 34 lacs (US\$ 69400) annually at the then prevalent cost of steam.

A large iron and steel plant in India, installed a Forbes Marshall thermocompressor for recovering turbine exhaust. The thermocompressor helped them recover 9000-10,000 kg / h, resulting in a direct saving of almost Rs 2 Crores (US\$ 409000). Since then, they have installed two more Forbes Marshall thermocompressors.

## How does a Thermocompressor work...

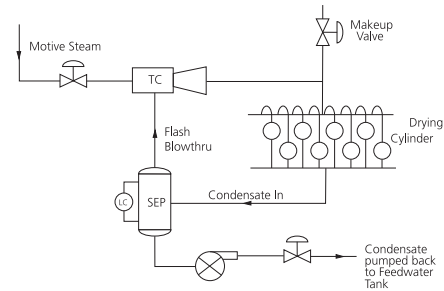
In the Thermocompressor, high pressure motive steam accelerates through the nozzle. As it enters the suction chamber at supersonic speeds, it entrains and mixes with low pressure steam from the suction inlet. The resultant steam mixture then enters the convergent-divergent diffuser where its velocity reduces, and its kinetic energy is converted to pressure energy. The steam discharged by the thermocompressor is then re-cycled to the process.



## Applications

### Paper Industry

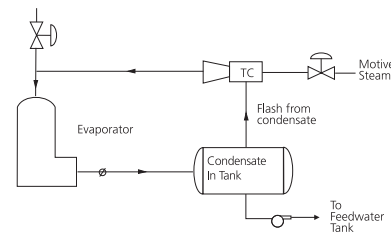
Paper Industries world-wide are now converting conventional cascade and trap based systems to Thermocompressor recirculation systems. Forbes Marshall Thermocompressor maximise flash steam recovery and enhance condensate removal from the drying cylinders by providing effective "blow off". The result is improved machine efficiency, uniform heating surfaces, and higher operating speeds. Thermocompressor can be installed on Yankee m/c, MG cylinder, multiple dryers m/cs, (Blowthru and Steam trap systems).



Thermocompressors in Paper

### Sugar Industry

With Forbes Marshall Thermocompressors, vapour recovery from the last stage of the multi-stage evaporators results in substantial cost savings in a sugar plant. And, as most plants also run a turbine for their power requirement, low pressure steam from the turbine exhaust can also be "boosted" for re-use in the distillery.



Thermocompressors in Sugar

Thermocompressors boost low pressure flash steam recovered from the condensate of reboilers and other equipment to increase production and slash fuel bills

### Co-generation

With power demand increasing daily, a number of industries have opted for co-generation plants to ensure uninterrupted power availability. Here, Forbes Marshall Thermocompressors can recover low pressure steam from the turbine exhaust. 'Boosting' this low pressure steam to a higher usable pressure achieves substantial energy savings and improves plant efficiency.

### Chemical Industry

The LP flash steam generated from the condensate (HP & LP condensate from reactor columns) is boosted with the help of thermocompressor and is recirculated back in the LP process.

### Petrochemical Industry

Steam is the preferred medium of heat transfer in a number of petrochemical drying and distilling processes. Recovery of low pressure steam from turbine exhaust and condensate flash steam recovery from heat exchangers make Forbes Marshall Thermocompressors effective energy savers.

### Rubber / tyre Industry

Flash steam generated from the condensate coming out of Vulcanisers can be compressed with thermocompressor and reuse in the vulcanisers. A schematic of typical application in tyre industry.

### Solvent Extraction Industry

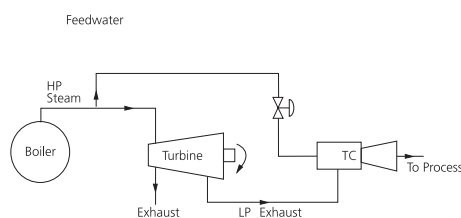
Flash steam recovered from the condensate of the Desolventizing Toasters (DST) can be boosted through a Thermocompressor and re-used in solvent extraction processes. Condensate from cookers and evaporators can also be combined with the DST condensate to maximise flash steam recovery.

### Other applications

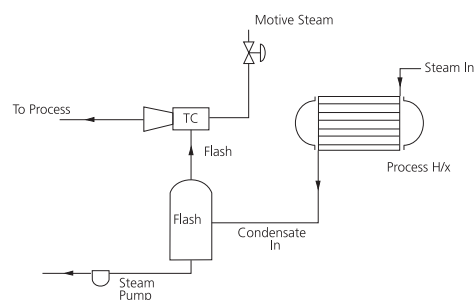
Forbes Marshall Thermocompressor systems can be used in numerous other applications where low pressure steam (either from a process, a flash vessel or turbine exhaust) is available and boosted to a usable pressure by using high pressure motive steam. Apart from being maintenance free, Forbes Marshall Thermocompressors are cost-effective tools for conserving energy and improving plant efficiency. Typical generic applications involve recovering both condensate and flash steam using Thermocompressors.

### Pharmaceutical Industry

In bulk drug production, steam is used in reboilers, evaporator columns, and stills. Forbes Marshall



Thermocompressors with Turbine



Thermocompressors on Typical Process

## Thermocompressor Control System

The Thermocompressor System is a comprehensive package that can be integrated seamlessly into your current control system. Every critical item in this package is designed and manufactured by the Forbes Marshall Group, enabling you to benefit from our comprehensive performance guarantee.

The Thermocompressor control system consists of a pressure transmitter, controller, I-P Converter and a control valve on the motive steam line. Based on the set point of the controller, the control loop regulates the flow control valve and ensures a constant discharge pressure from the Thermocompressor.

An optional vent valve is provided to remove any non-condensable gases and air during system start-up. In addition, this valve is also used to bleed excess flash steam to prevent back pressure. A make-up, or pressure reducing, valve may also be provided in case additional steam is required, to meet process demand.

A strainer, a moisture separator, and a thermodynamic trap module are provided on the motive line to remove any foreign particles or moisture in the motive steam.

A check valve on the suction line ensures no reversal of flow occurs into the suction line.

Pressure gauges and temperature gauges indicate the pressure and temperature of steam on all lines.

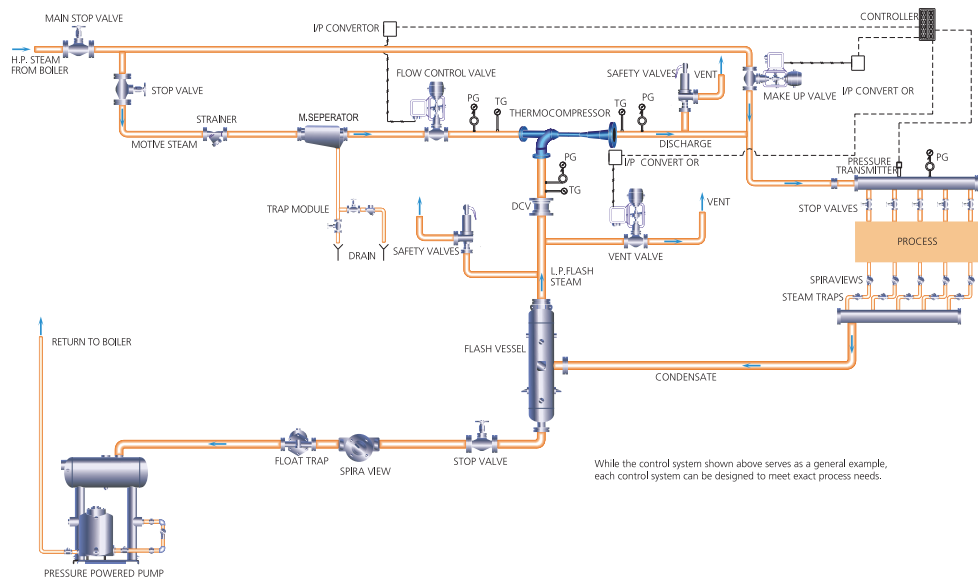
Flow meters quantify the motive and suction steam flow.

To ensure complete system safety, safety valves are provided on the suction and discharge lines to prevent any excess pressure build up.

## Some of our satisfied clients who have installed Thermocompressors and have slashed steam bills

- Setia Kawan, Indonesia
- First Paper, Uae
- Union Papers, Uae
- Pt South Pacific, Indonesia
- Mostafa Paper, Bangladesh
- Pegant Ltd, Kenya
- Gill Oil Company Ltd., Kenya
- Islamic Paper Mills, Egypt
- Kertas Blabak, Indonesia
- Nuplas, Uae
- Everest Paper Mills Pvt. Ltd, Nepal
- Pt Gunung Gilead, Indonesia
- Mekabox, Indonesia
- Tisco, India
- Indal, India
- Dr.reddy's Lab, India
- Sipc Pharma, India
- ITC, India
- BILT, India
- Pudumjee Paper Mills, India
- Ruby Mecons, India
- Gayatri Paper Mills, Afica
- Middle East Paper Company, Uae

*For more information regarding our Thermocompressor and your potential savings, call our Forbes Marshall representative.*



While the control system shown above serves as a general example, each control system can be designed to meet exact process needs.



[www.forbesmarshall.com](http://www.forbesmarshall.com)

OFFICES AND REPRESENTATIVES

INDIA: Tel: +91 (0) 20 39858555 / +91 (0) 20 27145595, Fax: + 91 (0) 20 27147413, Email: exp@forbesmarshall.com USA: Tel: +1 650 327 4227/ +1 650 321 4224, Fax: +1 650 327 4127/ +1 650 321 4454, Email: forbesmarshall@ix.netcom.com CANADA: Tel: +905 361 2525, Fax: +905 361 6401, Email: cansupport@forbesmarshall.com COLOMBIA: Tel: +57 316 721 1510, Email: fsforbes@gmail.com THAILAND: Tel: +66 2 7203483/4 +66-81-9020690, Fax: +66 2 7203483, 9435500, Email: thailand@forbesmarshall.com, vphillip@ksc.th.com INDONESIA: Tel: +62 8 15199 17178, Email: hbhat@forbesmarshall.com SINGAPORE: Tel: +62 8 15199 17178, Email: hbhat@forbesmarshall.com VIETNAM: Email: vphillip@ksc.th.com, Tel: +66 81 90 20690 MALAYSIA: Tel: +62 8 15199 17178, Fax: +62 21 4530773, Email: hbhat@forbesmarshall.com KOREA: Mob: ++8211 732-7695, Tel: ++822 2026-6364 (Direct), Fax: ++822 2026-6363, Email: shinwoofa@emp.l.com, forbeskorea@emp.l.com SRI LANKA: Tel: +94 11 2512997/4511127/28, Fax: + 94 11 451112, Email: fmlanka@forbesmarshall.com, wfermando@forbesmarshall.com BANGLADESH: Tel: +88 028811501/+88 01711529502, Email: bangladesh@forbesmarshall.com, rmar@forbesmarshall.com NEPAL: Mob: +977 9851022039 / 9851036530, Tel: +977 (1)4247676/4238131, Fax: +97714238131, Email: ekt@ecomail.com.np KENYA: Tel: +254 734 763 913 / +254 725 490 866, Email: africa@forbesmarshall.com ETHIOPIA: Tel: +251-911-145524, Fax: +251-115-511479, Email: Biruk.Oasis@gmail.com EGYPT: Mob: +201 68802964, Ph No +202 3036935/52/81, +202 3045637, Fax: + 202 3036897, Email: mchakraborty@forbesmarshall.com IRAN: Tel: +98 912 1304598, Email: m.m.rezaee@gmail.com, mmrezaee@forbesmarshall.com U.A.E ( Dubai): Mob: (971) 50 4949084, Tel: (971) 04-3350020, Fax: (971) 04-3356648, Email: csequeira@forbesmarshall.com / sequeira.cedric@gmail.com Technical Parts Co (LLC), Tel: + 971-2137888 / +971501572434, Fax: + 971-4-2823078, Email: mdas@forbesmarshall.com

**Forbes Marshall**  
Trusted Partners.  
Innovative Solutions.