Fueling KPIs, Driving KRAs
Solutions for the Automotive Industry
Solutions for the Automotive Industry

The Automotive industry comprises a wide range of companies and organisations involved in the design, development, manufacturing, marketing, and selling of motor vehicles. It is one of the world's largest sectors by revenue and constantly drives the economy of every country. It is also a huge consumer of energy—be it electricity, steam, compressed air or water. Most plants take several steps and measures to ensure the efficient consumption of these utilities to save on energy consumption without having to compromise on the quality, efficiency or productivity.

Forbes Marshall, being an organisation that is dedicated to process efficiency and energy conservation adds value to the Automobile Industry by providing various effective solutions by following the three major steps to reduce utility consumption: measure, analyse and control.

With our years of expertise in control instrumentation and state of the art data analytics (Industry 4.0), we help you monitor, analyse and benchmark the critical parameters that affect your process, factors that impact and lead to excess consumption of utilities, thereby providing you with a roadmap to control the overall demand and showcase savings through reduction in power consumption.
Process Efficiency
With our instrumentation solutions we help Industry achieve better throughput, reduced process time, predictive maintenance or energy savings, thus resulting in better productivity and reduced cost of operation. We offer a wide range of instruments to serve all the measurement, monitoring and control requirements for an industry. Our product portfolio includes solutions for measuring key parameters like water quality, control valves, pressure, temperature, flow, level, vibration, flue gas monitoring and control systems to accurately assess process performance.

Energy Conservation
Our range of products, packages, solutions and services help bring down the cost of utilities like steam, water, compressed air and others, throughout the process - from generation to distribution and utilisation right up to recovery.

Environment
Industrial pollution is a major contributor to air and water pollution worldwide. Pollution monitoring equipment helps Industry comply with set norms and regulations and reduce environmental impact. Our range of water quality analysers for industrial effluent and sewage treatment plants help monitor important parameters like pH, BOD, COD, TSS etc, while high quality instruments for analysing of emission gases like SOx, NOx, CO2, O2, dust and velocity analyser help measure and monitor parameters as per the pollution norms.
Steam is the major source of thermal energy for process industry. Steam accounts for 5% to 40% of total processing cost based on the type of industry segment.

With our knowledge and products, Forbes Marshall complements boilers and boiler house equipment with a host of services and solutions that help maximise energy right through the steam system circuit. Investing in a Forbes Marshall boiler gets you much more than just a boiler. It delivers expertise that ensures steam is at the lowest possible generation cost, both at the point of generation as well as at the point of consumption.

Our expertise in combustion and steam engineering helps us build solutions for the complete steam system, beyond boilers.

Our latest range of gas fired boilers offers innovative and intelligent alternatives in smaller capacity boilers.

Forbes Marshall offerings include new boilers, retrofit of burners and burner conversions (gas) and modernisation of boiler house.
High Efficiency (94% Rated Efficiency)
Boiler and burner perfect match
Dual insulation
Continuous online monitoring system
Oxygen trim control
Truly wet back construction
ECR and MCR burner technology

Combustion and Turndown Ratio
Turndown of 1:4 on oil and 1:6 on gas
Electronically modulated air to fuel ratio control
Electronic compound regulation burners, fuel saving by 2-3%
Ratiotronics for gas modification

Ease of Operation and Maintenance
Fully automatic and unmanned operation.
Equipped with self-diagnostic systems for trouble shooting
Automatic boiler blowdown control system

Safety
Twin drum water level controllers
High sinking time
VPS (valve proving system) for gas firing
Heat recovery unit - variable ‘Q’ technology

High Uptime
Zero leak piston valves
Vertical multistage centrifugal feed water pump in SS construction.
Complete instrumentation from Forbes Marshall
Digital fault detection system with data logging

Ease of Installation
Completely packaged construction
Skid mounted, no foundation
Monoblock burner, no foundation required
Pre-wired and factory insulated with no site work
The Efficient Compressor House

With over 60 years of experience in providing solutions for energy savings in various industries and utilities, Forbes Marshall boasts of expertise in providing energy efficiency services for utilities such as compressed air, steam, water and electrical systems.

We provide a comprehensive bundle of services that help in the optimisation of compressed air networks. Our services help identify and define system problems, whether they are in demand, distribution or supply, and provide solutions, allowing you to meet your return on investment goals.

We have a varied range of products for monitoring, controlling, analysing and optimising compressed air consumption. These products offer a complete control of your whole compressed air network, help increase efficiency and reduce your energy costs.

Our range of solutions includes compressed air audits, demand control systems, compressor control systems, network monitoring solutions, flow meters and others. Through our various services and solutions we have been able to support our customers in achieving energy efficiency in diverse industrial sectors such as automotive, textiles, cement, power, glass and various others.

Typical Losses

<table>
<thead>
<tr>
<th>Loss Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressor Energy Consumption</td>
<td>10.0%</td>
</tr>
<tr>
<td>Compressed Air Losses</td>
<td>7.0%</td>
</tr>
<tr>
<td>Leakage and Expansion Losses</td>
<td>4.5%</td>
</tr>
<tr>
<td>Cooling and Drying Losses</td>
<td>1.5%</td>
</tr>
<tr>
<td>Refrigerated Dryer Energy Loss</td>
<td>1.5%</td>
</tr>
<tr>
<td>Pressure losses in filters, dryer and pipework</td>
<td>0.5%</td>
</tr>
<tr>
<td>Motor Losses</td>
<td></td>
</tr>
</tbody>
</table>
**Ideal Scenario**
- Maximum compressor efficiency
- Optimised discharge pressure
- Reduced discharge pressure across dryer, filters and piping
- Eliminated/reduced unloading time by improving system capacitance which in turn provides better control
- Reduced transmission loss
- Optimised cooling water system
- Reduced compressed air leaks < 5%
- Optimised operation and demand pattern
- Improved quality of inlet air and compressed air
- Benchmark on quality and consumption of air as per IS8573

**Steps to Maintain an Efficient Compressor House**

1. **DISCOVER**
   - Improve
   - Audit

2. **IMPLEMENT**
   - Optimize
   - Reassess

3. **AUDIT**
   - Save
   - Sustain

4. **MONITOR**
   - PROFIT
Compressed air is the most expensive utility in any plant and therefore monitoring the entire network is of vital importance. Monitoring of compressed air (FAD) at the generation side helps understand the efficiency at which the compressors are performing and gives an early indication of wear and tear; at the user end the demand of flow sometimes exceeds the required amount and the artificial demand results in excess energy consumption and increased cost.

The Forbes Marshall Solution
Forbes Marshall’s FAD meter and compressed air flow meters are an innovative cost-effective solution for measurement and monitoring of compressed air. This gives you the most accurate solution for compressed air utility metering. The flow meter works on the vortex principle with online pressure and temperature compensation and is the only practical solution for measuring compressed air consumption on the generation side as well as the distribution lines. It is cost-effective, highly accurate and easy to install.

Let’s Look at a Case
Initially, the average demand per flow in the paint shop was 225 SCFM with a pressure of 6.3 barg; after implementing our flow meter and monitoring regularly, it was observed that the section can operate on a lower pressure and lower volume of air without affecting the actual process requirements. Hence, after the average demand per flow was brought down to 175 SCFM with a pressure of 5.5 barg i.e., 50 SCFM and 0.6 barg saving in each user side.

Now, for the whole plant, the saving was more than 550 CFM (i.e., 110 KW) which is over 20% of the total plant demand. (Savings up to Rs. 42 Lakhs per annum)

Benefits
- Specialised solution for utility metering of compressed air
- High accuracy
- Cost effective solution
- Maintenance free sensor design
Artificial Demand Control System

Fluctuating compressed air supply is a major issue faced in various industries due to the varying rate of demand and supply along with the inability to cater to useful storage. These fluctuations in air pressure lead to increased consumption of energy, interruptions in production schedules, inconsistent equipment performance and variable product quality which further gives rise to artificial demand in the process sections.

The Forbes Marshall Master Air Controller (MAC) is an energy saving control system which actively helps control the balance across the demand and supply sides. It introduces a differential pressure between the receiver and itself and thus creates a useful high-pressure storage. This helps in isolating the compressors from the demand surges. Peaks in demand are handled by the MAC, rather than being directed towards the compressors. This allows compressors to run for longer on no-load. As a result, mass of air is reduced and a high and compressor load cycles are reduced. This decrease in compressor load cycles is directly proportional to the decrease in energy consumed by the compressors. Thus, due to the MAC compressors are protected from artificial demand and have to cater only to base demand, resulting in savings on compressed air energy consumption.

Let’s Look at a Case
Considering, compressor of 480 Kwh of average flow 3398m³/hr (i.e.2000 CFM)
Total KWh consumption for 8000 operating hrs. @ 7 barg for a year is 38,40,000 Kwh
Reduction in pressure from 101.526 PSI to 84.12 PSI (proposed)
Considering leakage of 20%
Saving in power and flow is 12%
Total saving in KW is 4,60,840 KW

Benefits
- Saves energy consumed by air compressors by cutting artificial demand for Compressed air
- Reduction in compressor loading and induces higher unloading period
- Consistent air pressure delivery to demand side
- Demand reduction tends to reduce leakages in plant
Zero Loss Drain Traps (ZLDS) and Zero Loss Moisture Removal System

**Traditional Method**

- Moisture Separator
- Auto Drain Valve

**The Forbes Marshall Solution**

- Moisture Separator
- Piston Valve
- LD1
- Y-Type Strainer

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**Traditional Methods Used**

- Manual open valve drain
- Timer operated solenoid drain

These methods lead to loss of compressed air and risk the presence of moisture in the system which is not desired. This loss of compressed air has to be compensated with extra supply from the compressor.

Every 5 SCFM of compressed air generated consumes up to 1 KWh, which is equivalent to 50 SCFM loss per drain.

**Energy Losses Through an Orifice**

<table>
<thead>
<tr>
<th>Trap Orifice Size (mm)</th>
<th>Power Load (KW)</th>
<th>Energy Lost (INR/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8</td>
<td>0.2</td>
<td>6,451.2</td>
</tr>
<tr>
<td>1.6</td>
<td>0.8</td>
<td>25,804.8</td>
</tr>
<tr>
<td>3.2</td>
<td>3.0</td>
<td>96,768.0</td>
</tr>
<tr>
<td>6.4</td>
<td>12.0</td>
<td>3,87,072</td>
</tr>
</tbody>
</table>

**Challenges Faced**

- Significant loss of compressed air
- More power consumption as it operates irrespective of the presence of moisture

- Reset required based on the weather conditions
- Rust and corrosion in the air system piping
- Productivity losses throughout operation

**The Forbes Marshall Solution**

Separates and removes any moisture present in the air distribution network without any loss of use, format suggested for BENEFITS icons compressed air and thereby generating savings through reduced power consumption.

**Benefits**

- Zero loss of compressed air
- No power source or pneumatic supply required for operation
- Operates based on the level of moisture present
- Maintains instrument air quality
Handling the wastewater output from a process industry, treating it before disposal and meeting stringent pollution board norms has always been a tedious task. Therefore, it becomes very essential to run the effluent treatment plant effectively to achieve the desired results as well as optimise the process so that the cost of operation is minimal.

The Forbes Marshall Solution

We provide a complete energy efficient automation package for ETP to ensure precise online monitoring and control the treated water quality.

DO based aeration control of a wastewater treatment plant is among the highest electricity consuming processes. Our AquaMax package is an energy efficient solution that monitors and controls the dissolved oxygen levels with optimised operation of the aerator. It also helps bring down electricity bills as a direct benefit with a defined ROI period.

Our pH monitoring and dosing system for the neutralisation pit of an ETP plays an important role to control the treated water quality.

Flow monitoring of effluent at inlet and outlet of the ETP helps the user keep a track of the incoming loads and outlet quantity.

Multi-parameter analysers for measurement of COD/BOD/pH/TSS help the user comply to PCB norms.

Benefits

- Direct electrical energy savings in terms of deduced bills
- Stabilised DO/COD and BOD levels
- Maintenance free sensors for continuous monitoring
- Reduced operational cost of ETP
- Automated recording and reporting
## Challenges Faced

| **Compressor Room** | Compressor efficiency through loading and unloading time  
Compressor health monitoring (through pressure build-up time)  
Dryer health and efficiency  
Online pressure difference based on flow rates |
|----------------------|------------------------------------------------------------------|
| **Distribution Network** | Efficiency of air compressor network which includes pressure drop to identify losses  
Predicting load demand based on the rate of pressure drop |
| **Process Sections** | Primary factors for fluctuations in excess air consumption  
Benchmarking ideal air consumption for individual sections  
Prediction of utility consumption/demand through a central intelligent monitoring system |
Utility Benchmarking Report for Paint Shop

- Customised report generation and follow through
- Detailed analysis of specific section and diagnostics based solution

Features and Benefits
- Creating a benchmark on the overall utility being consumed per section
- Help monitor the efficiency of compressors and compressed air network
- ROI through utility management
- Advance data analytics
- Future options include air leakage detection system
- Ensures continuity in production with full capacity and optimum utilisation of utilities
- Critical plant parameter data available on mobile devices
- Daily / shift-wise / monthly reports
- Seamless integration with various platforms
Rising material and utility costs, coupled with increased global competitions are forcing the Industry to trim cost of manufacture and wastage through precise measurement and accurate delivery. Thus, incoming and outgoing chemical handling becomes a very important section for a chemical industry to help achieve these results. Safety is of prime importance and hence industries are adopting automated systems for loading and unloading of costly chemicals. The time taken for transfer from the tanker to the bulk storage tanks or to the day tanks is also crucial. Therefore, industries need a safe and easy to operate solution to handle these concerns.

**The Forbes Marshall Solution**
- Stand-alone skid with out dependability on centralised system
- Entire instrumentation package including measuring and controlling instruments as per user requirements
- Customised package with remote switches or card reader facility
- User-friendly programme with facility to modify as per batch requirements
- Earthing detection for user / plant safety with fail-safe alarms
- Data logging and report facility for inventory management

**Benefits**
- Ensure quick and accurate transfer with zero loss
- Increased safety
- Reduced error
- Automated report generation
## Sector Centric Solutions for Automobile Industry

<table>
<thead>
<tr>
<th>Paint level measurement in paint storage tanks</th>
<th>Utility monitoring system</th>
</tr>
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<tbody>
<tr>
<td>Condensate recovery systems and steam solutions</td>
<td>Energy audits</td>
</tr>
<tr>
<td>Air and water balancing</td>
<td>Borewell level measurement</td>
</tr>
<tr>
<td>Sludge pit automation (paint sludge)</td>
<td>Continuous emission monitoring system</td>
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<tr>
<td>Engine testing rig with complete instrumentation</td>
<td>Vibration monitoring system for paint booth blowers</td>
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</table>

## Product Offering

<table>
<thead>
<tr>
<th>Sections / Products</th>
<th>Boiler Section</th>
<th>Compressor Room</th>
<th>Paint Shop</th>
<th>Air Distribution Line</th>
<th>Water Distribution line</th>
<th>Steam Distribution Line</th>
<th>Water</th>
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<tbody>
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<td>ETP</td>
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<tr>
<td>Electro Magnetic Flowmeter</td>
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<tr>
<td>Mass Flowmeter</td>
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<td>Variable Area Flowmeter</td>
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<td>Vortex Flowmeter</td>
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<td>Conductivity / Tds</td>
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<tr>
<td>Multiparameter Analyser</td>
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<td>PLC / DCS</td>
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<td>Traps</td>
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<td>VMS</td>
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</tbody>
</table>
Delivering Products That Perform
We have created an efficient business by integrating our knowledge, services and technology to provide innovative solutions for the automotive industry. Our installed base in this industry, stands testimony to this.

<table>
<thead>
<tr>
<th>Water Flow Meters</th>
<th>Free Air Delivery Flow Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5000+</strong></td>
<td><strong>800+</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Master Air Controller</th>
<th>Boiler and Steam Efficiency Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>100+</strong></td>
<td><strong>200+</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Compressed Air Flow Meters</th>
<th>Steam Flow Meter</th>
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</thead>
<tbody>
<tr>
<td><strong>400+</strong></td>
<td><strong>500+</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gauges and Transmitters</th>
<th>Energy Audits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>100+</strong></td>
<td><strong>150+</strong></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Steam Traps</th>
<th>Process Analysers</th>
<th>Control Valves</th>
<th>Moisture Drain Traps</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>300+</strong></td>
<td><strong>200+</strong></td>
<td><strong>150+</strong></td>
<td><strong>250+</strong></td>
</tr>
</tbody>
</table>

Forbes Marshall
Krohne Marshall
Forbes Marshall Arca
Codel International
Forbes Solar
Forbes Vyncke
Forbes Marshall Steam Systems

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