Turbo Technologies

HTi

The Latest Turbocharger News

The Worldwide Efficiency Drive

Executive Comments

In the last edition of HTi we touched briefly on the economic slowdown in the global market and how we are continuing to invest in engineering throughout our global facilities despite this uncertainty.

In addition, the New Year has brought with it new challenges with what is likely to be the longest recession in 30 years, potentially lasting through to 2010. The economic conditions we face today are extremely unique; the rapidness in which markets deteriorated has been alarming and the interlinked nature of global economies today has left no one unaffected.

In facing these tough economic times, Cummins Turbo Technologies has had to make some very hard choices to ensure that we remain competitive through the downturn. However, we can be certain of two things; where we have been as a company and where we want to be in the future.

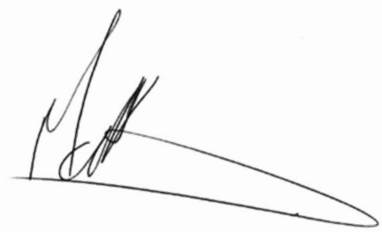
We have improved our operational and financial performance, which led us to record sales, once again, for 2008. Since 2005, Cummins Turbo Technologies has experienced a compound annual growth rate of 23%. We have experienced an outstanding delivery performance, maintained our market leadership and continued to drive forward with industry leading technology.

As we look to the future, there is no doubt that we can emerge from this recession in a much stronger position. With the right focus and investment in our capabilities, we will continue to strengthen our cost structure and position ourselves to capture rebounding markets globally.

Mark Firth

With the reliable supply of turbos to all customers, we can strengthen our customer relationships and open the door for new business. As we improve our processes, we will focus on quality and continue to deliver breakthrough air handling technology.

This twelfth edition of HTi shows how we are continuing to improve our processes and reduce costs through Six Sigma with savings in both of our Charleston facilities. We provide an overview of the turbocharger's recent contribution to lowering engine emissions and how Cummins Turbo Technologies has contributed to this. Finally, through our partnerships with local universities we aim to ensure that we attract the best young engineering talent to help secure our future.



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Dependable Technology
for Diverse Applications

Written by James Moorhouse; Marketing Co-ordinator

Holset turbochargers are commonplace on trucks the world over. However, Cummins Turbo Technologies also works in partnership with a number of its original equipment manufacturer (OEM) customers to produce turbochargers for some rather more unusual applications. Here are just three examples, drawn from the defence, leisure and industrial sectors.

Military Hovercraft

The Griffon 8000TD (M) military hovercraft is capable of carrying a payload of over nine tonnes at speeds of up to 50 knots (58mph or 93km/h). The 21 metre long craft is powered by two watercooled Fiat Powertrain V8 marine diesels. Each of these 800hp, 20 litre engines is fitted with a pair of Holset HX55W turbochargers.

The Griffon will accomplish any task performed by a fast boat but can go where no boat can venture; sand, mud, ice, snow, rocks, weeds, logs, debris and rapids. Built at Southampton, UK, the Griffon is in service with navy, army and paramilitary operations throughout the world.

One of its many important military roles is Mine Counter Measure (MCM). It produces virtually no pressure, acoustic or magnetic signatures, so is able to travel over mines without triggering them.

Snow Groomer

There are over 2,000 recognised specialist winter ski resorts in the world. Their pistes need to be regularly groomed to keep them in perfect condition for the millions of winter sports fans in search of exhilarating but safe skiing.

Kässbohrer Geländefahrzeug AG of Germany makes all-terrain vehicles for grooming and cleaning both winter sports runs and beaches. Its PistenBully range of snow groomers is the world's market leader among ski slope and trail preparation vehicles.

Kässbohrer Geländefahrzeug chose the reliable 8.9 litre Cummins QSL engine to power one of its bigger and most sophisticated machines, the PistenBully 400 snow groomer, launched last year. Rated at 370hp in this application, this Cummins QSL engine comes complete with a Holset HX40W turbocharger to deliver dependable performance and pure power on the slopes.

The engineering department at Cummins Turbo Technologies must consider many factors when specifying turbochargers. The duty cycle is always a key consideration, especially in the case of turbochargers destined for challenging applications like the PistenBully, which is likely to be operating at high altitudes and low temperatures. The Holset HX40W turbocharger on the PistenBully features a Machined from Solid (MFS) aluminium impeller wheel. MFS impellers are significantly more durable than cast impellers and are therefore well suited to high altitude operations where 'thinner' air means turbocharger speeds are higher than usual.

Shunting Locomotive

Vossloh Locomotives of Germany has specified the Cummins QSK23 engine for its new G6 three-axle diesel hydraulic shunting locomotive. The 23 litre, six-cylinder Cummins QSK uses a Holset HX83 turbocharger, helping to boost power output to around 870hp. This allows the heavy shunting locomotive, which has a tare weight of over 60 tonnes, to reach speeds of up to 50mph (80km/h).

The G6 locomotive recently won an innovation award sponsored by German private railway magazine, Privatbahnmagazin. The award recognises the Vossloh G6 for its exceptional tractive effort of 219 kN, its state-of-the-art control system and the low life-cycle cost of its Cummins Stage IIIA/Tier 2 QSK23 engine. The panel of judges also made special mention of the locomotive's wheel-sets that are able to move axially, allowing it to negotiate small radius bends more easily.

Vossloh's choice of the Cummins QSK23 was influenced by this engine's excellent power density and operating economy. The Holset HX83 turbocharger plays a vital role in achieving these characteristics.

Image courtesy of Griffon Hovercraft Ltd

Image courtesy of Kässbohrer Geländefahrzeug AG

Image courtesy of Vossloh Locomotives

Raising the Bar to Lower the Emissions:

Turbocharging in the Low Emission Era

Written by Henry Tennant; Senior Technical Adviser

In an earlier issue of HTi we described the development of the turbocharger, from Alfred Buchi's experiments early in the last century to the widespread application of turbocharging for vehicles during the past 20 years. The search for more performance and better fuel economy has long driven demand for turbocharging; now we add the need to reduce exhaust emissions.

Engine power and torque has continued to increase, with specific power reaching as much as 35kW/litre (47hp/litre) in some instances and up to 27 bar brake mean effective pressure. Over the same period the growing stringency of exhaust emissions legislation means that the control of fuel and air supply has had to become increasingly precise. Torque curves are both wider and higher than they used to be, so we have seen a growing demand on the turbocharger. It must be effective over a wider engine speed range, in particular providing more air at low engine speeds and also generate higher boost pressure ratios.

In order to meet these demands the simple fixed geometry turbocharger has seen continuous development, with a strong focus on boost pressure ratio and air flow range.

A pressure ratio of 3.5:1 at sea level is now commonplace, thanks to compressor design featuring increased back-sweep of the compressor blades and higher tip speed. This increases stress levels but that is overcome with better material properties and more sophisticated analysis techniques. Despite the extra stresses, life expectancy of turbochargers has been extended, not shortened. In applications where the standard cast aluminium wheel material is insufficiently durable, greater strength and durability can be obtained by using Machined from Solid (MFS) forged aluminium, semi-solid moulding (SSM), or wheels made from titanium. Better durability is no longer merely desirable, it is mandatory and spelt out in emissions legislation. For example, the heavy-duty engine Euro V legislation stipulates a minimum useful life of 500,000km for the emissions compliance equipment. That will rise to 700,000km/seven years for Euro VI engines.

Flow range improvements also come from advancements in housing design. Map width enhancement (MWE) ports enable the compressor to operate at low airflows without surging and extend the compressor's maximum flow capacity. Holset Super MWE™ gives further reduction of the air flow at surge by moving the point of re-entry of the MWE flow further upstream.

Holset Axial Turbocompound

Holset Electric VGT™

Holset Pneumatic VGT™

Holset Command Valve™

Controlling turbine power

The turbine side of the turbocharger generates the power to drive the compressor to its required operating point. Boost pressure operated wastegates have been developed by Cummins Turbo Technologies to include those operated by a Holset Command Valve™, where the boost signal controlling the opening of the wastegate is itself modulated by a control valve to determine the opening point. This allows higher boost pressures at low engine speeds to enhance the torque curve and transient air flow.

The variable geometry turbocharger takes control of the turbine's power to the next level. Introduced in heavy-duty applications in 1998, the Holset VGT™ exercises control of boost pressure over a wider engine speed range than a simple wastegate. The turbine flow is restricted at lower flows and during transients to increase the expansion ratio and thus the turbine power, giving more boost pressure. At high air flows the turbine can be opened to limit the maximum boost pressure and turbocharger speed.

The widespread use of electronic engine controllers to manage increasingly complex fuel injection systems has led to a demand for electric rather than pneumatic actuation of wastegated and variable geometry turbochargers. Electric actuation is highly responsive, so boost pressure demand can now be met more quickly and more precisely. The electric actuator sends feedback on its position, temperature and so on back to the engine's management system and this information can be used for on-board diagnostics. This aspect is becoming particularly important because the ability to monitor the operation of any emissions related component in the engine system is mandated by the latest emissions legislation.

Holset MFS Titanium Impeller Wheel

Even though modern turbochargers may offer a wide compressor flow range and high pressure ratios, there are some engine applications where two-stage turbocharging is necessary to meet the air requirement. The engine air flows through two compressors to develop very high overall pressure ratios, in the region of 4 or 5:1 and intercooling can be used to improve the apparent efficiency of the system.

Cummins Turbo Technologies has developed a modulated two-stage turbocharging system known as M^2 ™; this is a more complex type of two-stage turbocharging that can be used where very high boost pressures are required at low engine speeds. The technique can be applied to smaller light and medium-duty engines where a high rated power is required, together with very high torque at low engine speed. The first stage is a high-pressure turbocharger, sized for the flow corresponding to low engine speeds. At higher engine speeds an arrangement of by-pass valves diverts exhaust gas (and if necessary the compressor flow) to a much larger, low pressure second turbocharger stage. In this way an engine with a very wide speed range can be supplied with the correct air requirements.

Meeting the needs of EGR

One of the heavy-duty engine emissions solutions to emerge over the past decade is exhaust gas recirculation (EGR). A proportion of the exhaust gas is recirculated to the engine inlet manifold. During combustion the presence of the additional exhaust gas reduces the production of NOx (oxides of nitrogen), one of the exhaust gases regulated by emissions legislation. Modest EGR rates of around 5% were sufficient to satisfy earlier emissions limits but now rates of 30% or more are being used by engine makers who want to satisfy the new tougher NOx limits without using exhaust after-treatment.

The EGR process is dependent upon achieving the correct pressure gradient between the exhaust and inlet manifolds, allowing the exhaust gases to enter the inlet manifold. The turbocharger helps do this. A variable turbine gives control of the EGR rate over the speed and load range and the Holset VGT in particular has been shown to be very good at regulating EGR flow. This is because the flow and efficiency characteristic of the Holset VGT allows the pressure difference across the engine to be varied with a degree of independence from the boost pressure.

Turbocompound systems incorporate a second turbine in the exhaust system that extracts additional waste energy and feeds it back to the engine crankshaft. Originally, this system was used to give very good fuel economy at high power outputs. Now, with the increased use of EGR to cut NOx emissions, the turbocompound system can be used to offset some of the fuel economy penalty associated with the high exhaust pressures in EGR systems.

In the last ten years, turbocharger technology has advanced significantly. The next ten years will be just as challenging and Cummins Turbo Technologies will be providing solutions to meet these challenges for its customers across the globe.

The Worldwide Efficiency Drive

Written by Owen Ryder; Principal Engineer, Air Handling

Even though the price of crude oil is now well below half of what it was a year ago, there is no let-up in the quest for better fuel efficiency. At the 2008 IAA commercial vehicle show in Germany, ACEA, the European automobile manufacturers association, announced that European truck manufacturers were committed to cutting fuel consumption of trucks by an average of 20% per tonne-kilometre by the year 2020.

This is in line with a European Union target to reduce greenhouse gas emissions by 20% over the same period. Similarly, the Transportation Industry Efficiency Act in the USA is also targeting a significant reduction in fuel consumption for cars and light trucks. Legislation is already in place in Japan for the reduction of fuel consumption of heavy-duty truck engines by 2015.

The link between fuel consumption and the environmental concerns surrounding greenhouse gases is clear. Every litre of diesel burned produces exhaust emissions that include 2.6kg of carbon dioxide (CO_2), the predominant greenhouse gas. So burning less fuel delivers indisputable environmental benefits as well as straightforward cost savings and with oil resources harder to find, using oil wisely is becoming more important. A heavy-duty truck can consume $75,000 worth of fuel each year, so even a 1% improvement in engine efficiency cuts the annual fuel bill by $750. In short, making engines more efficient is highly desirable from all perspectives.

Major reductions in CO_2 emissions will be driven by a combination of political and legislative actions as well as operational and technical solutions. Improving engine efficiency is at the heart of the last of these.

How can turbocharger efficiency improve engine fuel consumption?

Turbocharging is usually regarded as a means of increasing engine power but is less well known as a way of improving efficiency. For a given power requirement, turbocharging allows the use of a smaller engine that has lower losses than a larger engine and is therefore more efficient. This concept of engine downsizing is not new and will continue wherever large capacity engines are not needed for other reasons.

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Another way in which the turbocharger improves efficiency is its ability to convert waste exhaust heat energy into compressed air for the engine intake. This means the pressure in the inlet manifold is higher than in the exhaust manifold and the difference helps push the engine round, so some of the engine power is developed without burning extra fuel.

The following equations show how improvements in compressor and turbine efficiency produce better fuel economy.

In the equations that represent compressor and turbine power, the efficiency is represented by the symbol 'eta' (η). If we consider that all parameters for compressor power stay the same but the compressor efficiency (η_{comp}) is increased, then it is clear that compressor power input requirement will be reduced.

$$Compressor\ Power\ (W) = \frac{\dot{m} \times C_P \times T_{in} \times \left(PR^{\left[\frac{\gamma-1}{\gamma}\right]} - 1\right)}{\eta_{comp}}$$

Where:

$\dot{m}$ = air mass flow rate

C_P = specific heat at constant pressure

T_{in} = inlet temperature

PR = pressure ratio

γ = ratio of specific heats

η_{comp} = compressor efficiency

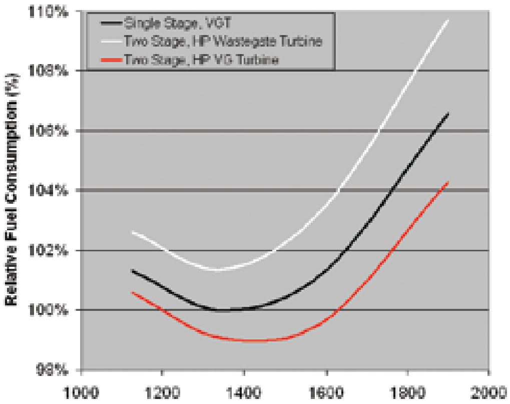
This means that less turbine power is needed, so in the turbine equation the expansion ratio (ER) could be reduced, either by using a bigger turbine housing or opening the variable geometry turbine.

$$Turbine\ Power\ (W) = \eta_{turbine} \times \dot{m} \times C_P \times T_{in} \times \left(1 - \left(\frac{1}{ER}\right)^{\left[\frac{\gamma-1}{\gamma}\right]}\right)$$

Where:

ER = turbine pressure ratio or expansion ratio

$\eta_{turbine}$ = turbine efficiency



Fuel Consumption for a Heavy-Duty EGR Engine

If the turbine efficiency is also increased, then the expansion ratio can be further reduced whilst still developing the required turbine power. Lowering the expansion ratio means the exhaust manifold will be at a lower pressure. In our example, we kept the compressor pressure ratio the same so the inlet manifold would be the same pressure as before the efficiency increase. Therefore we have the same inlet pressure (i.e. pressure on the piston during intake stroke) but a lower exhaust pressure (i.e. pressure on the piston during the exhaust stroke). The net result is that less power is absorbed by the exhaust stroke, leaving more available at the crankshaft. Hence, more engine power is achieved for the same fuel!

Having the inlet manifold at a higher pressure than the exhaust manifold makes it difficult to feed exhaust gas back into the inlet manifold, which is the technique used by the increasing number of engines featuring exhaust gas recirculation (EGR). Precise control of turbocharger efficiency is essential here to give just enough pressure difference to allow EGR to function without generating excessive back pressure that would compromise fuel consumption. Holset VGT™ turbochargers with electronic control facilitate precise operation of EGR and boost, delivering better fuel consumption than other systems, particularly across the middle of the engine speed range.

Turbocharger efficiency is also vital for good transient response times, developing boost pressure as quickly as possible when an increase in engine power is required. This is becoming increasingly important as engine manufacturers strive to comply with evermore stringent exhaust emissions legislation. More emissions are produced during the transient portions of emissions test cycles than during the steady state conditions.

How can we improve efficiency?

Improving turbocharger efficiency is not straightforward and it comes at a price, usually in terms of the operating range. We could make a turbocharger highly efficient but only across a narrow flow range. This would make the vehicle difficult to drive, as power would be available over only a small speed range. Normally, that would be unacceptable but it can be an attractive proposition for engines paired with variable or hybrid transmissions where a wide engine speed range is not needed.

Honing the airflow within a turbocharger can make a significant contribution to its efficiency. That entails close attention to the internal surface finish to reduce losses due to drag and turbulence. The design of the blades is also critical, ensuring that the air flows through them at the correct angle, avoiding separation and stagnant areas that impede flow through the wheels. Cummins Turbo Technologies uses sophisticated computational fluid dynamics (CFD) models and highly experienced to study and optimise component shapes to deliver the best performance.

The position at which peak efficiency is reached is an important design criterion. The turbocharger will be designed and matched so that it is most efficient under the operating conditions in which the engine will spend a large proportion of its time. Positioning peak efficiency at high pressure ratios is good for high-load applications but peak efficiency at low pressure ratios is better for light-duty applications. A turbocharger system effective at low load will not perform well at full load and such applications may need more than one turbocharger to get the best efficiency across a sufficiently wide operating range. Sequential systems will bring this benefit to applications with a high percentage of time spent at low load. Intercooled two-stage systems also bring benefits but only on applications where both turbochargers are working hard at the same time.

Understanding the engine's most frequently used operating points and designing for these conditions makes the turbocharger's best efficiency available exactly where the engine makes best use of it.

The bearing system also plays a part in a turbocharger's overall efficiency, because bearing loss means some of the turbine power does not reach the compressor. This is less of an issue at high turbocharger speeds but more relevant at lower speeds where bearing losses are a larger proportion of the total power transmitted by the turbocharger shaft.

Turbocompounding can also improve the efficiency of an engine because it extracts more energy from the exhaust than a single turbine. Cummins Turbo Technologies' power turbines are proven to enhance efficiency in applications running at high loads.

The future

There is no doubt whatsoever that fuel efficiency will continue to figure prominently on the agenda of legislators, vehicle manufacturers and vehicle operators alike. Emissions limits, greenhouse gas reduction targets and depletion of oil reserves mean that we must improve fuel economy. There is no single solution but at Cummins Turbo Technologies we are dedicated to enhancing the efficiency of our turbochargers and in the way that we specify them to suit different applications.

Six Sigma Ups the Tempo at Charleston

Over the last 10 years, Cummins Turbo Technologies has used Six Sigma methodology so extensively that it has become part of our DNA.

The purpose of Six Sigma is to identify areas where we can improve our business processes and then implement change. We start by defining a problem. Then we list or measure all the potential variables affecting the cost or the process. We analyse the data to determine what is most responsible for driving up costs or causing mistakes. We improve the process by modifying the variables. Finally, we put controls in place to make sure that we follow the new process and deliver better results.

Recently, we have used Six Sigma to make a number of significant improvements at our two plants in Charleston, South Carolina.

Heavy-Duty Shaft and Wheel Machining

Led by Thuan Pham; Six Sigma Black Belt

One of the issues that we needed to address at Charleston, Leeds Avenue was that machining of heavy-duty shafts and wheels was not keeping pace with demand.

The first step was to use better teamwork to enhance daily productivity, with a daily morning meeting scheduled to review the previous day's output. If there had been any hold-ups yesterday, the team aimed to make sure that they would not re-occur today.

The team's next focus was on the machines where bottlenecks were most likely to occur. It decided to implement continuous production on these, running each of them through lunchtimes and breaks on a rotating schedule.

Material Ordering System

Led by Jerome Gilliard; Technician

The team then looked at material ordering and delivery and streamlined the process. After implementing these changes and collecting additional data it was determined the line was not balanced with equal processing time at each operation. The decision was taken to move from three shifts to 2.5 shifts each day. The partial third shift comprised a small group of team members focused solely on the machining operations that caused the bottlenecks.

The overall result of these changes is that the output of the heavy-duty shafts and wheels machining team has risen by 70% per person per day. We have now completely eliminated the third shift and the line continues to improve.

Improving Productivity by Cutting Waste

Employees at Cummins Turbo Technologies' second Charleston plant at Palmetto have applied Six Sigma techniques with particular success in reducing waste.

Waste can occur for a variety of reasons, such as overproduction, excess inventory and wait time. Whatever the reason, it eats into the overall productivity level. Six Sigma tools have been used to slash the amount of waste, boosting Palmetto's productivity during the course of the last year.

The following waste-reduction projects are some of those that have contributed to this on-going success at Palmetto.

Impellers Improvement Project

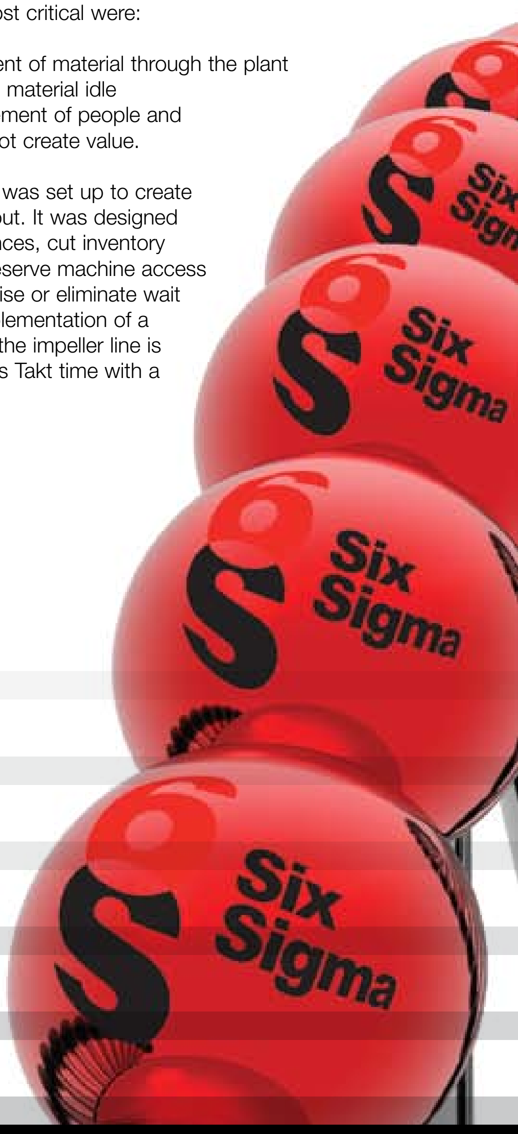
Led by Josh Boyd; Six Sigma Black Belt

This project was initiated to ensure that the impeller line could meet the Takt time (the time available for a complete manufacturing process in order to meet customer demand) for all stations for the volumes expected in 2009.

Value stream mapping was used to identify the various wastes in the impeller line. The most critical were:

- Conveyance: movement of material through the plant
- Wait time: people and material idle
- Wasted motion: movement of people and machines that does not create value.

A cross-functional team was set up to create a work-cell oriented layout. It was designed to reduce walking distances, cut inventory between operations, preserve machine access requirements and minimise or eliminate wait times. Following the implementation of a series of improvements the impeller line is now capable of hitting its Takt time with a higher productivity.



Reduce Waste on Shaft and Wheel from Shaft Grind to Wash

Led by Douglas Blanton; Six Sigma Black Belt

A value stream map, similar to that carried out for the impeller project, was used to identify the various types of waste in the shaft and wheel line.

Equipment capacity constraints were identified and a cross-functional team worked to create and compare various line layout configurations. They found that grouping the machines more closely shortened walk distances and allowed inventory between operations to be reduced and wait times to be cut.

Witness simulation was then used to validate the planned improvements before a decision was made as to which layout would be used. As equipment moves were completed, cross functional focus was given to identify potential issues and address.

Reduce Waste on Shaft and Wheel from Mass Centre to Temper Oven

Led by Clay Batts; Operations Leader

The team focused on reducing walking distances, improving the flow of production and increasing output. The goal was to use cellular manufacturing methods to achieve 'one-piece flow'. This is the opposite of batch production and is recognised as an extremely efficient way of manufacturing.

The project's results included:

- Output of cell 1 increased by 24% per shift, with one person
- Walking distance was cut by 50% in both cells
- Work in progress was cut by 90% in both cells
- Manufacturing footprint area was cut by 50%
- Introduction of a production monitoring system to sustain the improvement and assist in making further progress.

Looking Back to Move Forward:

The Importance of Service Data

Written by Simon Mallard; Reliability Engineer

Service data is a valuable source of information for Cummins Turbo Technologies. It tells us how the turbocharger is performing against design predictions and provides an insight into how we can improve and refine the design of the next generation of turbochargers.

The worldwide service organisation of Cummins Turbo Technologies is responsible for collecting data from turbochargers returned as faulty by our customers. Service engineers inspect the returned turbochargers and the cause of the fault is diagnosed and logged in a database. Individual components are often analysed in our Materials Laboratory to help determine the cause of failure.

Raw service life data has to undergo a thorough analysis before it can be used as a basis for reliability predictions that model the life of the turbocharger in the field. The starting point is to check the accuracy of the data to ensure that the analysis results are not compromised.

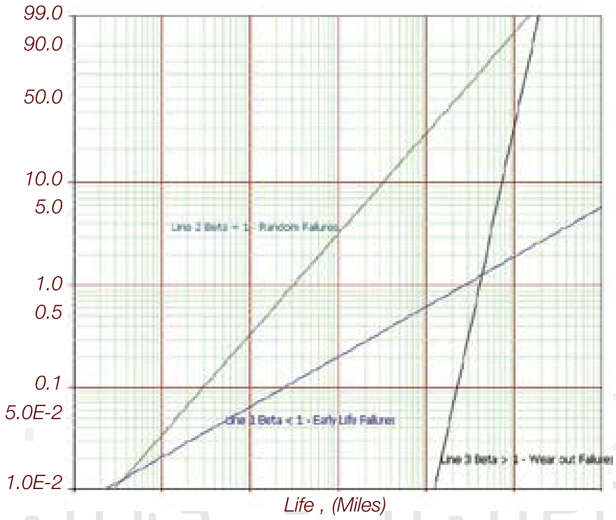
The basic information provided by the service database includes the failed component, the fault, mileage, date the unit went into service and date the problem was identified by the customer. We also like to use other information for the analysis, such as engine rating, duty cycle and the location in which the vehicle was operating. In general, the more information the customer provides, the better the analysis.

The data is analysed to:

- Highlight emerging issues or areas for product improvement
- Assess whether a new design has improved reliability over a previous design
- Predict reliability of new products before their release, using current product service data
- Predict failure rates of a turbocharger and its components.

Data analysis

The most commonly used analytical tool for examining life data is Weibull analysis. This involves fitting a classic statistical distribution, known as a Weibull distribution, to the data. This method of analysis was developed by Wallodi Weibull, a Swedish mathematician and engineer and is used throughout the world in the study of component and material failure. The strength of the Weibull distribution is that it can provide very useful predictions based on relatively small datasets. Studying a Weibull plot helps us to identify the type of failure issues that are contained within the data.



Sample of Weibull plot with three sets of data

The x-axis shows the life of the turbochargers in miles; the y-axis shows the percentage of the field population that has failed. Notice that the three plot lines have different slopes. The slope, called the Beta value, can show the nature of the failure. For slopes of less than 1 (Line 1), the failure is early life and is due to 'burn-in' issues such as manufacturing defects. Slopes equal to 1 (Line 2) indicate random failures that are part of the useful life of the turbocharger, such as those caused by its operating environment or over-stressed components. Slopes greater than 1 (Line 3) indicate wear-out failures such as fatigue or corrosion.

Analysing life data in this way helps to classify the issue and points towards where we need to focus our efforts to improve reliability and durability.

As turbochargers become ever more complex and further integrated into engine systems, establishing the cause of failure is becoming not only increasingly difficult but also increasingly critical. This underscores why collection and analysis of service data will continue to be an important activity for Cummins Turbo Technologies.

Putting Young Engineers in Pole Position

Written by Gillian Murray, Marketing Communications Leader

Cummins Turbo Technologies continues to back young talent and inspire innovation through support of a local Formula Student team.

Cummins Turbo Technologies has long-standing connections with the University of Huddersfield, UK and is the major sponsor of its Formula Student team, dubbed Team HARE (Huddersfield Automotive Racing Enterprise). Formula Student is an annual competition for automotive engineering students throughout Europe. Run by the Institution of Mechanical Engineers (IMechE) the competition challenges students to design and build a single seat racing car. This year's competition will culminate in July at an event at Silverstone where the cars will be judged on the basis of design, cost and presentation. There will also be several dynamic tests on the track, measuring the cars' capabilities.

The University of Huddersfield has entered Formula Student every year since the first event back in 1999. Sponsorship of the team is one of the ways that Cummins Turbo Technologies forges strong links with the University, investing in development of future skills.

"Cummins Turbo Technologies is proud to support young, local talent through the Formula Student project which allows them to demonstrate their design, technical and project management skills important to the long-term future of our industry," explains Jim Lyons; President, Cummins Turbo Technologies. The company has further supported four of the team members by previously employing them as industrial placement students.

Professor Bob Cryan; Vice Chancellor of the University of Huddersfield, commented "We are extremely pleased that Cummins continues to take an active role in the Formula Student project. The University has an excellent reputation for its automotive engineering courses. Working with the professionals from Cummins gives them an excellent grounding in the skills they will need in their future careers. I'm sure Cummins and the University will be a winning combination!"

Jim Lyons led a group of Cummins Turbo Technologies experts at a recent visit to the University workshop to meet Team HARE and examine progress on the car. The team was looking for tips and inspiration to help optimise the car's performance. The two principle objectives for this year's design have been to reduce the car's weight by 50 kg and increase power, improving acceleration and handling.

The car's Honda CBR600FSi engine is supercharged in order to overcome the limitation imposed by the 20mm diameter air intake restrictor, demanded by the competition rules. The aim is to increase peak torque and reduce the engine speed at which it occurs. This will give the car more punch at lower engine speeds, a characteristic that should suit the Formula Student dynamic tests.

The Formula Student competition will test the design and engineering skills of Team HARE to the limit as they develop a formula style race-car to compete with automotive industry's engineering stars of the future. Cummins Turbo Technologies hopes that the experience will stand team members in good stead off the track too as they complete their studies and head out into industry. Follow Team HARE by visiting the team blog: www.teamhare.co.uk

Jim Lyons pictured with Team HARE and Professor Bob Cryan

Turbo Technologies

Our Philosophy

We enable our customers success through our expertise, dependability and responsiveness.

Our Goals

Cummins Turbo Technologies places the utmost importance on achieving high levels of product and service quality.

Our people are the single most valuable asset we have to ensure we meet your requirements. Through structured training development programmes we encourage our employees to spend approximately 5% of their working time in training and personal development.

Our operations worldwide are certified to TS16949 quality standard and we welcome suggestions as to how we can further improve our performance to meet your needs.

We take our environmental obligations seriously and all our worldwide sites have achieved ISO14001. Our products have an important part to play in helping to improve engine emissions.

Our goal is to provide the lowest total cost solution for your turbocharging needs.

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