melett

Melett newsletter issue ten

QUALITY REPLACEMENT TURBOCHARGER PARTS

Improved Stock Availability at Melett!

In preparation for another busy and exciting year we are pleased to announce that we have introduced additional warehouse capacity to further enhance our stock availability.

The 12,500 sqm warehouse is adjacent to our existing UK Head Office and will house goods-in, quality, inspection and kit building operations. This will help us to be more proactive in meeting customer orders, and the increased warehouse space will accommodate our ever expanding range.

"Currently we are investing in major operational improvements in the UK that will significantly benefit our customers." says Ian Warhurst, Melett's Owner and Managing Director. "In recent months we have seen significant growth, this investment will allow us to further improve ensuring we deliver the stock availability and service levels our customers expect."

The new warehouse will be a flagship 5S facility within Melett, to provide increased efficiency as demand grows further. Mike Sweeney, Warehouse Manager at Melett commented "It is an exciting time for everyone at Melett, our new procedures have boosted productivity to an all-time high. New warehousing systems will ensure that operations continue to deliver excellent service for our customers."

In addition to our operational improvements, we are constantly working to increase our product range. The development process is now better than ever, meaning we are able to bring new parts to market much quicker than before. Customer feedback and development requests on the website help us to develop the right parts to meet market demand.

Hot Topic:
Future of Diesels

New Product
Developments

In The News:
Electric Turbocharging

Cast vs MFS
Compressor Wheels

Melett - Helping the Reconditioning Industry to keep Reconditioning

This Issues Hot Topic: The Future of Diesels

As the global car industry faces increased scrutiny following the Volkswagen emissions scandal, there is no doubt that this revelation will naturally have an impact on our market, but to what extent?

Volkswagen has admitted that it circumvented the emissions control system in over 480,000 2.0-liter diesel vehicles sold in the United States since 2008, to meet strict NOx emission test regulations.

Euro Emission Standards

European emission standards define the acceptable limits for exhaust emissions of new vehicles sold in EU member states and were first introduced in 1992.

Euro 1 (July 1992) – Initiated the switch to unleaded petrol and the universal fitting of catalytic converters to petrol cars to reduce carbon monoxide (CO).

Euro 2 (January 1996) - Further reduced the limit for CO emissions and introduced different emissions limits for diesel and petrol vehicles.

Euro 3 (January 2000) - Added a separate NOx limit for diesel engines and introduced separate Hydrocarbon (HC) and NOx limits for petrol engines.

Euro 4 (January 2005) - Concentrated on cleaning up emissions from diesel cars, reducing particulate matter (PM) and oxides of nitrogen (NOx). Some Euro 4 diesel cars were fitted with particulate filters.

Euro 5 (September 2009) - Tightened the limits on particulate emissions from diesel engines and all diesel cars needed particulate filters to meet the new requirements. For the first time, a particulates limit was set for petrol engines.

Euro 6 (September 2015) - Imposed a significant reduction in NOx emissions from diesel engines (a 67% reduction compared to Euro 5) and established similar standards for petrol and diesel.

Overall, since Euro 1, PM levels have been reduced by 96% and NOx levels by 87%. To achieve this, new technologies have been developed and adapted to fit vehicle exhaust systems.

Emission Reducing Technologies

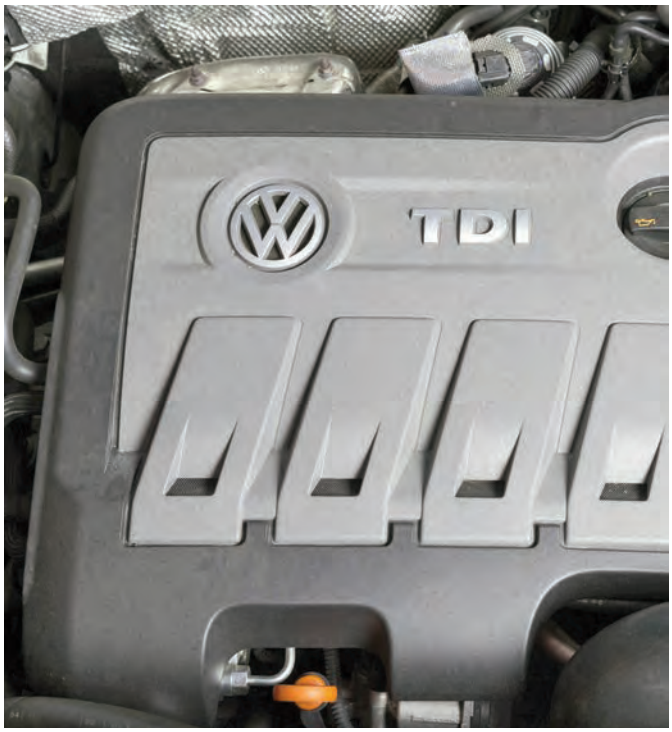
Catalytic converters, originally launched in the 1970's, were designed to clean up CO and HC particulates released as part of the engine combustion process. They react to temperature, converting CO and HC to Carbon Dioxide and water. The reaction depends upon a certain temperature being achieved so they do not work as efficiently in colder climates.

DPF's (Diesel Particulate Filters) were introduced from January 2005 Euro 4 where diesel particulate levels were reduced to extremely low levels, to reduce the allowable size of PM released to the atmosphere. Reducing the size of PM from the combustion process to this level was not technically possible, so this meant all diesel vehicles after September 2009 were fitted with a filter to capture soot and other harmful particles, preventing them entering the atmosphere. A DPF can remove around 85% of the particulates from the exhaust.

To tackle the reduction of NOx, Selective Catalytic Reduction (SCR) systems were introduced in 2010. The SCR system is where Urea (AdBlue) is injected into the exhaust post combustion. In the exhaust, the fluid is converted into ammonia (NH3) which reacts with the NOx in the 'NOx accumulator,' breaking the chemical bond and converting NOx into Nitrogen and water. SCR technology alone can achieve NOx reductions by up to 90%, and is one of the most cost-effective and fuel-efficient technologies available to help reduce diesel engine emissions. However, in real world driving conditions, the SCR systems do not work as efficiently and can produce much higher emissions when compared to laboratory testing conditions.

Since Euro 1, PM has reduced by 96% and NOx levels by 87%

When the Euro emission levels were set, most engine manufacturers did not believe that they were achievable in the set time frames and lobbied to try and change the levels or time frames. In the absence of revised levels, the manufacturers have made great progress to develop and launch the new DPF and SCR systems. However, the method for testing and proving that the systems do actually achieve the set levels appear to have been flawed – this has allowed manufacturers to achieve the correct levels in lab conditions but these do not relate to the actual emissions produced in real world driving conditions. This is now at the heart of the VW scandal.



The Future for Turbocharging

For a long time before the VW scandal broke, Governments and Environmentalists were very vocal about the correlation between the increase in diesel passenger cars and the increased pollution in cities. Whilst the new DPF and SCR systems reduce the emission levels, what will these vehicles be like in 10 years?

Potentially, increased ammonia in the atmosphere is a new pollutant which may result from SCR systems. Adblue is highly corrosive and the complexity of sensors and injection systems required for them to function will be very expensive to repair. The DPF works well but has a limited life and during failure, DPF's are responsible for many turbo failures as a result of increased exhaust temperatures during regeneration. The cost of a replacement turbocharger, plus DPF costs, is leading to perfectly good vehicles in the aftermarket being written off. The industry is also becoming plagued with low quality aftermarket variants of DPF's which do not work and cause further issues to vehicles. In many cases, the DPF is removed and the ECU is re-programmed leaving vehicles emitting worse than Euro 1 levels of emissions.

The automotive industry has been aware of this for some time and has invested heavily in improving the efficiency of the gasoline engine. As a result, many new technologies are entering the market which are improving the efficiency of the gasoline engine to be comparable with diesel engines. Governments are also changing the incentives currently offered on diesel cars to gasoline cars, and as a result European Diesel penetration is predicted to fall from 53% in 2015 to 35% by 2020.

The good news is that one of the key technologies for improving the efficiency of gasoline engines is turbocharging. Not only will the reduction in diesel engines be replaced by gasoline turbo engines, forecasts also show existing gasoline engines

being replaced by turbocharged gasoline engines - so the expected percentage of turbocharged vehicles will increase.

One of the dangers the aftermarket faces if older vehicles continue to be incorrectly or poorly repaired, is the risk that Governments may introduce scrappage schemes to reduce the worst polluting vehicles. This provides Melett and Melett customers with an opportunity to send a strong message to the repair market, as it will be more important than ever to ensure older vehicles are repaired with the highest quality and correctly air flowed turbos, to ensure emissions are kept as low as possible.

One of the key technologies for improving the efficiency of gasoline engines is turbocharging

BSI ISO9001 Quality Management Success at Melett China

We are pleased to announce that our manufacturing facility, Melett China, has recently been awarded the ISO 9001 quality management system by BSI, the world renowned business standards organisation.

ISO 9001 is the world's most widely recognised quality management standard and it outlines ways to achieve, as well as benchmark, consistent performance and service. The BSI standard was chosen by Melett China to mirror the high standards of Melett UK, and is a very rigorous and strict auditing process in China.

Robin Paras, Quality and Engineering Manager at Melett China commented on their recent success *"The achievement gives credit to the dedicated effort of all Melett China employees. The accreditation from BSI will not only help us to manage our business, but will enable us to provide greater customer service and support, and ensure continuous improvement as we grow and develop our manufacturing capabilities."*

Melett Product Development in Focus

All the latest development news

NEW Core Assembly Developments:

In line with industry demand, we have recently launched a series of new core assemblies for passenger and commercial vehicle applications. All of our core assemblies are assembled and VSR balanced in our own, fully equipped, UK Core Production Facility. Individual components are also available.

- **K03** – Volkswagen 1.4L. Melett part number **1302-003-937**
  (Fits turbos ***5303-970-0099/0142/0150/0162/0248***)
- **GTB2056VK** – Mercedes Benz M-Class/E-Class 3.0D.
  Melett part number **1102-020-927** (Fits turbos ***777318-0001/2***)
- **GTB1749VK** – PSA Jumper/Ducato/Boxer 2.2D.
  Melett part number **1102-017-900** (Fits turbos ***798128-0002/4/6***)
- **GTB1749V** – Volkswagen Multivan/T5 Transporter 2.5D.
  Melett part number **1102-017-936** (Fits turbos ***760698-0002-6***)
- **HX55** – Various Cummins heavy duty commercial vehicles.
  Melett part number **1153-055-900** (Fits various turbos)
- **GTA2260LV** – Iveco Daily 3.0D.
  Melett part number **1102-122-901** (Fits turbos ***768625-0001/2/4***)

Coming Soon:

- **B2** – Ford Powerstroke 6.4L Twin-turbo (high pressure).
  Melett part number **1332-002-900** (Fits turbos ***179515/ 479515***)
- **GTB1749VK** – Mercedes Benz Sprinter 2.2D.
  Melett part number **1102-217-904** (Fits turbo ***759688-0007***)
- **K26** – BMW 5 Series 3.0D Bi-turbo.
  Melett part number **1301-026-900** (Fits turbo ***5326-970-0000***)
- **GTB1752VK** – BMW 1 Series 2.0D.
  Melett part number **1102-217-903** (Fits turbo ***750952-0014***)
- **TD04** – Volkswagen Crafter 2.5D.
  Melett part number **1401-404-930** (Fits turbo ***49377-07515***)
- **GTB1546V** – Opel/Vauxhall 1.7D Astra and Zafira models.
  Melett part number **1102-215-901** (Fits turbo ***779591-0002***)

New Repair Kits - Coming soon

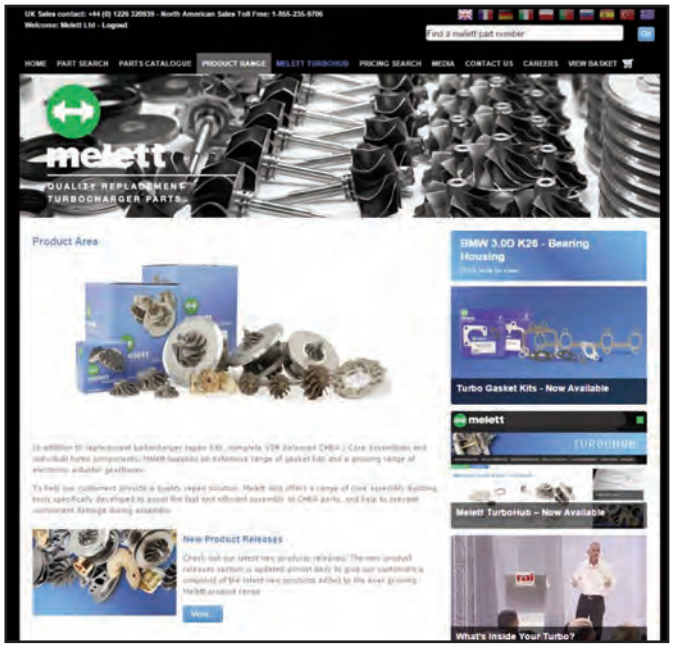
- **GT15 – 25Z** – Z Bearing Repair Kits
  Major Repair Kit – 1102-022-755 (Fits various 3.0D applications)
  Now available: Major Repair Kit - 1102-014-751
  (Fits various 2.0TDI applications)
- **K0C** – We are currently developing a Repair Kit for the Ford F-150 EcoBoost. Look out for **1302-003-756** (Major Repair Kit) on our New Product Bulletins in early 2016!
- **Continental CM5G-6K682-HD/GB** – We have developed a repair kit for the 2012 1.0D Ecoboost, Ford Focus and C-Max models (Fits turbos ***1761178/81***)
  - **Major Repair Kit** (Reverse Rotation) - **1650-010-755**
  - **Minor Repair Kit** (Reverse Rotation) – **1650-010-750**
- Cross Shaft Repair Kit for **HE500 / HE531V**,
  Melett part number **1154-551-765** (Fits various applications)

To receive regular product bulletins contact turbo@melett.com

Melett Website – Product Area

Check out our product area which provides a snapshot of our complete product range, from repair kits, complete VSR balanced core assemblies and individual turbo components, through to our extensive range of gasket kits, electronic actuator gearboxes and new product releases.

Simply click on the 'Product Range' tab on the website to find out more.



MFS Compressor Wheels

Towards the end of 2015, we launched a variety of MFS Compressor Wheels for a range of different BorgWarner and Mitsubishi applications, increasing our range to include the following turbo numbers:

Turbo Number	Turbo Model	Melett Part Number
5303-970-0139/0205/0208	BV43	1303-043-402
1000-970-0065/0098/0102	KP35	1303-035-405
5304-970-0140	K04	1302-004-403
49335-00584	TF035	1401-635-403
5304-970-0064	K04	1302-004-404
5439-970-0081-2/0097	BV39	1303-039-415
5303-970-0189	BV43	1303-043-403
5303-970-0190	BV43	1303-043-404
5303-970-0129/0137/0207	BV43	1303-043-405
5304-970-0086	K04	1302-004-405
5439-970-0099/0106	KP39	1303-039-416
5439-970-0086/0094 /0098/0114/0136	BV39	1303-039-417
5435-970-0027	BV35	1303-035-406

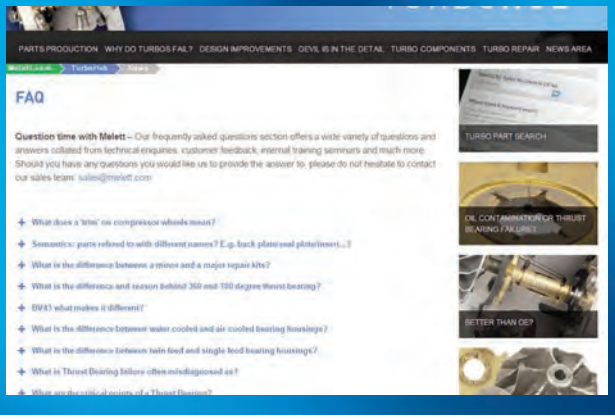
Turbocharged Gasoline Engines

Turbocharging in gasoline engines is becoming more popular with the current downsizing trend. Garrett's range of Modern Gasoline Turbos (MGT) is designed specifically for the latest generation of gasoline engines. One such turbo model is the **MGT1446MZGL** for the 1.4L Opel/Vauxhall Ecotec, which has an integrated exhaust manifold, compressor recirculation valve and PWM valve controlling the wastegate actuator.

We are currently developing the core assembly for the Opel/Vauxhall 1.4L Ecotec engines, look out for Melett part number **1102-014-901** (Fits turbo ***781504-0004***).

Frequently Asked Questions (FAQ)

Have you a question for Melett? The TurboHub includes Frequently Asked Questions (and Answers) in response to technical enquiries, as well as questions about Melett design improvements, upgraded parts and the critical differences between parts.



Our Gasket Kit range is growing!

We now have more gasket kits in stock covering over **3,400** applications, with many more currently in development.

Visit www.melett.com for full cross-referencing information. All gaskets can be found on the Turbo Buildsheets, simply search the Melett website using the turbo number.

In the News:
Out with the old, in with the new?

End of the Road for Natural Aspiration?

Ten years ago who would have thought the naturally aspirated engine would be considered as a niche market? Today, turbocharging is the dominant technology and it is now common place for diesel engines to contain one, two or even three turbochargers. Even the advocates for natural aspiration, such as Ferrari, have had to admit defeat and adopt turbocharging into their new supercar designs. So why have vehicle manufacturers lost their passion for naturally aspirated engines?

The key driver behind the decline of natural aspiration stems from the car industry in Europe and the quest for greater fuel efficiency and a reduction in harmful emissions. In 1992 the EU signed the Koyoto Protocol, which insisted that the world pull emission levels back by 8% by 2012. Fast-forward to 2015 and the introduction of Euro 6 legislation, which defines the acceptable limits for exhaust emissions of new vehicles sold in EU member states.

To meet these stringent regulations, a turbo remains the most efficient solution to reduce emissions without sacrificing performance. A naturally aspirated engine is renowned for its capabilities in terms of power and high revs, but with the massive disadvantage of high fuel consumption, which does not comply with modern emissions legislation. Compared with a naturally aspirated engine of identical power output, the power-to-weight ratio, i.e. kilowatt (power output)/ kilograms (engine weight), of a turbocharged engine is much better than that of the naturally aspirated engine, with the added benefit of weighing less. This reduces the overall mass of a vehicle and makes it easier for engineers to develop more compact engines. In addition, the cost and simplicity of engineering turbocharged performance are huge benefits to vehicle manufacturers, whereas a naturally aspirated engine can be extremely expensive to make.

With the continuing pressure to reduce CO_2 emissions and fuel consumption, the turbo has proved to be the most efficient boosting device and therefore, unless legislation dramatically changes over the coming years, the naturally aspirated engine looks set to remain out of favour.

Electric Turbocharging

As legislation continues to tighten, the need to improve efficiency and performance means that turbocharging alone is no longer sufficient for some high powered vehicles. Instead electric boosters are a new technology being utilised to maintain high response rates at low engine speeds.

In principle, an electric 'booster' provides power to a compressor that enhances the engines performance without relying on exhaust gases. Still in its infancy, Audi is one of the first to develop a 2.5L TT sports car that includes both a turbocharged five-cylinder gasoline engine and an electric booster.

According to reports, an electrically powered compressor can provide significant advantages. It rapidly reaches maximum speed and continues to boost charge pressure when a small amount of drive energy is left in the exhaust gas for the conventional turbocharger. This advancement makes it possible to design the conventional turbocharger for high engine power – the e-booster maintains response at low engine speeds. Electric boosting provides opportunities to deliver torque to the drivetrain, providing the performance people expect, whilst saving fuel. Industry sources suggest that an electric booster can respond instantly (within 250 milliseconds) and can reduce fuel consumption by 10 percent.

Electrification could be the next stage of high performance vehicle development, for both diesel and gasoline engines, however, this technology is still in its infancy. Traditional turbocharging is still the industry's hot topic and in our opinion is here to stay!

If you would like access to the TurboHub, please email login@melett.com

Cast vs MFS Compressor Wheels

'Machined from Solid' compressor wheels are the latest in a long line of developments from the OEMs to enter the aftermarket. Here we explore the evolution of the compressor wheel to determine if there are any benefits to using MFS wheels on standard cast wheel applications.

Cast compressor wheels are crucial turbocharger components. With over 15 million turbos produced globally each year they have provided the durability and dimensional precision that, up until now, the majority of turbocharger applications have required. If a cast wheel is used by an OEM there is no particular advantage to using an MFS wheel, unless there are known application issues that could affect the integrity of the compressor wheel.

Traditionally, compressor wheels are produced from aluminium because of its low density weighing only one third of the weight of steel. It is also a relatively simple and inexpensive process to cast compressor wheels, but a major disadvantage is that cast aluminium is inherently not as strong as other manufacturing techniques. To create a stronger wheel post production processes are required, which include heat and solution treatments.

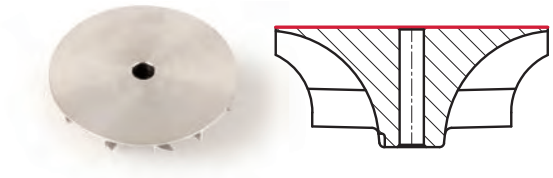
A high proportion of new turbochargers are spinning faster than ever before, with higher pressures, and as a result are subjected too much higher stresses which are beyond the limits of cast aluminium. Consequently, alternative materials and manufacturing processes are used.

If the compressor wheel material is not as strong as it should be it will eventually show signs of fatigue, because the blades are exposed to a continuous cycle of positive and negative stress caused by the wheel spinning fast and then slow.

Variations in Design

In response to the ever changing operating conditions there have been significant developments in compressor wheel design over the years.

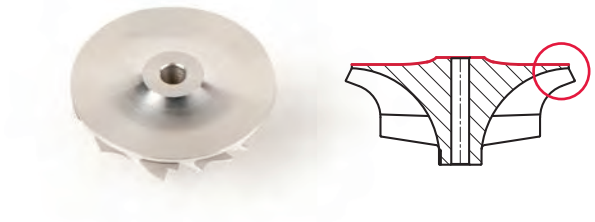
Flatback: Is the earliest design of compressor wheel and is still used by some manufacturers.



Superback: This design was introduced due to the increased speeds that turbochargers rotate, which increases the force on the compressor wheel significantly. In particular the exducer diameter of the compressor wheel suffered the most. The Superback adds more material to the highest stressed area, therefore coping with higher loads.

Deep Superback: An exaggerated design of the Superback which strengthens the wheel further by adding more material around the highly stressed hub.

Deep Superback - Extended tip: This design promotes greater airflow providing a faster boost response at lower engine speeds. The extended tip design increases the efficiency of the compressor wheel at higher boost pressures.



'Machined From Solid'

Taking the design process one step further, the OEMs introduced a new method of manufacturing compressor wheels known as 'Machined from Solid' (MFS), primarily due to cast aluminium not being strong enough for higher operating conditions.

By using a forged aluminium bar, it is possible to use a much stronger aluminium alloy than can be used in the casting process. By using a stronger material, the wheel has a much longer life in comparison to cast wheels as it can carry much higher loads.

In addition, MFS wheels are ideal for low production runs, enabling manufacturers to respond quicker to new blade design technology as there is no delay due to casting tooling. The wheels are produced using sophisticated 5-Axis technology to carve out the blades from a solid bar of high strength aluminium alloy, providing superior durability. Each wheel is precision balanced on fully automated balancing stations with auto-correction – although the precision of the machining operation often means that the wheel doesn't need any balance correction. To create an even stronger wheel on specific high stress applications, titanium can be used, which prevents failure in applications susceptible to high cycle fatigue.

MFS and the Aftermarket

To conclude, if the OEM turbo is designed with a cast compressor wheel then there will be little or no advantage to using an MFS wheel other than if the application often suffers failure through fatigue - in which case an aftermarket upgrade would be appropriate.

On-going Trends: Reducing Emissions

Clean Diesel Campaign

From the 1st September 2015, all new cars sold in Europe must meet the Euro 6 emissions requirements. As a result, several automotive and motor trading associations have launched an online clean diesel campaign to raise awareness about cleaner diesel fuel; advanced engines and effective emissions control technology. To find out more about the campaign visit **www.cleandieseltech.eu**

Ford Raises EcoBoost Efficiency

Ford is set to help increase efficiency of its 1 Litre, three-cylinder turbocharged gasoline engine by 60%, as they develop cylinder deactivation technology. To read the full article, check out **Ford stops a cylinder to boost gasoline efficiency** under Industry Articles on the TurboHub News Area.

[Source: Automotive Engineer – June 2015]

Hybrid system aims to cut NOx

Diesel engine manufacturers are under pressure to reduce fine particulate emissions in Europe since the introduction of the new Euro 6 directive. Earlier this year, Bosch announced they had designed a new boost recuperation system to reduce NOx emissions at the point of combustion. To read the full article, check out **New Bosch mild hybrid system aims to cut NOx** under Industry Articles on the TurboHub News Area.

[Source: Engine Technology International –July 2015]

Downsized turbos for Honda Civic

Honda has announced that two all-new downsized turbo gasoline engines will be coming to Europe with the next-generation Civic. To read the full article, check out **All-new downsized turbos for next-generation Honda Civic** under Industry Articles on the TurboHub News Area.

[Source: Engine Technology International – October 15]

New for 2016: V4.0 Major Parts Catalogue

Our 2016 Major Parts Catalogue has arrived! Throughout 2015 we developed hundreds of new, quality components and core assemblies to make repairs of all types of turbochargers possible. The catalogue is a quick reference guide to help you identify major components and is supported by the website where you can find over 40,000 detailed turbo build sheets.

For ease of use, we have kept the same indexing system and simple layout, as well as highlighting in red **all new products released in 2015**.

In addition, we have also updated our Workshop Reference Manual which provides up to date technical information for inspecting standard components, as well as technical data with sizes and machining tolerances.

If you haven't already received your catalogues, please contact **sales@melett.com** to request your free copy.

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Head Office · Melett Limited · Unit N · Zenith Park · Whaley Road · Barnsley · S75 1HT · England
T: +44 (0) 1226 320939 · F: +44 (0) 1226 320949 · sales@melett.com · www.melett.com

Melett North America Sales and Distribution Centre
Melett North America Inc. · 4400 S. Mendenhall Suite 12 · Memphis · TN · 38141 · USA
T: 1-901-322-5896 · F: 1-901-360-8667 · Toll Free: 1-855-235-9706 · USsales@melett.com · www.melett.com

Melett Polska Sp. z o.o. · Ul. Solna 16 · 85-862 Bydgoszcz · Poland
T: +48 52 320 00 49 · F: +48 52 348 24 59 · polska@melett.com · www.melettpolska.pl

Melett Latin America Sales Office · Celaya · Guanajuato · Mexico
T: +52 461 6120901 · Cell: +52 461 2192685 · ventas@melett.com · www.melett.es

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