

## TECH TALK TURBOS



# Putting a light on the TURBO

▼ Chris Kambouris, MD of TurboDirect SA. "The general truck operator does not know how to look after his turbo – even though they are critical components to an engine's performance."

**There is one component fitted to trucks that is critical to an engine's reliable operation, correct emission production and under bonnet thermal management, yet is seldom spoken of or afforded the true attention it deserves. This component is the turbocharger. Sourcing information from TurboDirect SA, FleetWatch attempts in this article to bring the turbocharger into the spotlight of awareness.**

**W**hen our technical editor *Dave Scott* took a look back over the past 53 years of trucking in his article titled "A Drive down Memory Lane", he mentioned the fact that in the 1960s, the majority of diesel engines were normally aspirated. Turbocharging was still a long way off and as a result, engines lost altitude power - both kW and Nm - at 1% per 100m. Considering that Johannesburg is 1 753 m above sea level, that meant a loss of power of 17,5% for trucks driving from Durban to Johannesburg. Eieesh! How did they ever make the trip?

He cited as an example the then Mercedes-Benz model 2637 OM 443 V10 engine. This engine had a massive

capacity of 18 267 litres - "a thirsty beast that only delivered 370hp (266kW) in its normally aspirated format and 1 375Nm at sea-level ratings".

In the 1980s, turbocharging started to come in and Scott highlighted the difference this technology made by comparing the 18 litre engine of the past to today's modern, turbo-intercooled, common-rail Mercedes 501 LA diesel engine with a capacity of only 11.946 litres. This engine now produces 435hp (320kW) and 2 100Nm torque at any altitude.

"Over these years, trucks have become vastly more efficient and productive. Engine size has come down by a third while power has increased by 20% and torque has hugely increased by 52%. The rate of tons delivered in available hours is immensely superior today," says Scott – and the turbocharger has played a major role in these advancements.



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Chris Kambouris, founder, owner and MD of TurboDirect SA, is a recognised specialist, expert and top Guru when it comes to turbochargers having direct access to the largest international OE turbocharger manufacturers. TurboDirect SA is the officially appointed distributor for original OEM brands Garrett by Honeywell, and BorgWarner turbocharger systems. It is also a direct importer for Mitsubishi, Holset and IHI turbochargers.

This company lives, eats and sleeps turbochargers and offers the complete package which includes diagnosis, testing, servicing, repairs or supplying a brand-new turbocharger as well as fitting it to the vehicle. The group also runs and offers a full division for warranty claims and forensic analysis testing extending to micro structure and macrostructure analysis on any material failure or evaluation where required. It also offers training courses to the industry illustrating the facts about the life and death of turbochargers - and related turbocharger systems.

With his 18 years of experience working in this industry, Kambouris is regularly called upon for technical advice on turbos by universities, the motor trade, his international suppliers, OEM's - and even race teams - and one of his objectives is to educate all owners of turbo operated vehicles how to maintain and ensure the turbo does not break down and cost a fortune in repairs.

"The general truck operator really does not know how to look

after his turbo - and this despite the fact that turbochargers are critical components to an engine's performance," he says.

This is perhaps because of the fact that a turbocharger is an extremely reliable component and doesn't need much attention. According to Kambouris, it will normally last as long as the vehicle's engine life but here comes the problem: Many turbochargers don't see this due to engine maintenance related issues.

"Lack of maintenance, late maintenance or incomplete maintenance of a vehicle's engine will all shorten the life of your turbocharger. On the other hand, correct, timeous maintenance will prolong the life of your turbocharger," he says.

Enlarging on this he says that the turbocharger, although situated outside the engine, is fed the same oil as the engine from the engine's oil pump. The oil is fed through an oil feed line, which is the main "artery" feeding the life blood to the turbocharger. Therefore a turbocharger failure should be treated the same as an engine failure.

"When an engine fails, the entire engine is disassembled and checked for the cause of failure. This failure mechanism is resolved/replaced and the engine is then reassembled. Most engine rebuilds involve a new oil pump - being the main cause of many engine failures, besides wear components (rings, pistons, valve seats, valve stem seals etc). These are relatively affordable components normally ensuring a new life span of the engine."

When a turbocharger fails, however, because it is situated outside of the engine, it is normally treated as an alternator or starter motor and is merely removed, replaced - or repaired - and then re-installed.

"Just because the turbocharger is physically installed outside of the engine, it does not mean it operates independent of the engine. When it fails, it is imperative to treat it as if you were treating an engine rebuild," says Kambouris. "The most important step to ensuring a renewed service life from a turbocharger is to firstly find the cause of failure, correct this mechanism/component and then repair/replace the turbocharger and re-install according to the turbo manufacturer's procedures and guidelines."

The reason for this close attention is because although, as stated, the turbocharger is an extremely reliable component, it is an extremely hard-working and sophisticated component. "A turbocharger operates at enormous rotational speeds, often in excess of 120 000 rpm and operates at temperatures above 650°C in normal operating conditions. The latest Euro 5/6 engines turbochargers are manufactured with exotic materials and operate above 850°C." ▶ 32

▼ The Honeywell manufacturing plant produces turbochargers of all sizes for international markets. Below right is the main turbo unit.



**Honeywell  
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plant...  
turbo heaven**





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Tel: +27 (0)61 974 7895 Email: [gobey@pinnaclerisk.co.za](mailto:gobey@pinnaclerisk.co.za)

[www.pinnaclerisk.co.za](http://www.pinnaclerisk.co.za)

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### TURBO KILLERS

According to Kambouris, there are four main “killers” of turbochargers which can easily be addressed and managed in order to protect and prolong its life. They are:

- Lack of lubrication (oil starvation).
- Oil contamination (many different types of contamination exist).
- Foreign object damage (Debris impact).
- Exceptional operating conditions (often related to intentional changes).

To avoid these killers, he puts forward the following maintenance tips:

1. Service your vehicle on time, every time.
2. Use only genuine parts including oil filters, air filters and the correct grade of oil (check the owner’s manual for this, there is a very specific reason for this).
3. Allow the engine to idle for a short while to stabilize temperatures before shutting off the engine or drive the last few km’s of your journey slowly, “off boost” to allow air flow to start to cool down the engine and turbo before you arrive at your destination.
4. Replace the oil feed line at specific intervals depending on the vehicle make and application - information available from TurboDirect SA.
5. When replacing a turbocharger, always replace the oil feed line, oil, oil filter and air filter, regardless of mileage or oil condition.
6. If your vehicle has a worn engine (blow by past the rings) your turbocharger will give you problems.

The bottom line is that should you experience a turbo failure, don’t assume it is just related to the turbo. You need to find out what caused the problem and get this sorted out first before replacing or repairing the turbo. If not, it could just happen again. “Many truck owners make this mistake and it ends up costing them a fortune. Worse, is that vehicle may well be seriously damaged by not attending to the root cause,” says Kambouris.

### TURBO FACT



▲ A cut-out showing the innards of a turbocharger.

A **TURBOCHARGER** is a high-precision component that operates at enormous rotational speeds, often in excess of 180 000 rpm, and operates at temperatures above 650°C in normal operating conditions. The turbochargers in the latest Euro5/6 engines are manufactured using exotic materials and operate above 850°C in normal operating conditions.