BTAC

The British Transport Advisory Consortium

Representing leading UK Fleet operators

Technical Trials 2005 Report

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Forthcoming events

The BTAC theme for 2006 will be " Euro 4 and Beyond". In spring 2006 BTAC will hold its annual consult at which will discuss this very important subject, this will be followed by the Technical Trials , mid year, and then a wash up mini consult with the results of the trials.

Dates for the above will be announced in due course. If any member requires further details of the events or wishes to pre-enter the technical trials or consult or indeed any matter in conjunction with BTAC then please contact the secretary at BTAC , PO BOX 9108, Maldon Essex, CM9 5WW. Or Email **DavidPayne@Truckengineer.Co.uk**

Introduction

BTAC was founded in 1972. Its purpose is to promote a liaison between senior transport and logistics personnel so that by design, management skills and technical innovation, they may improve the cost effectiveness of the whole distribution chain. This is achieved by sharing knowledge, experience and skills, thereby introducing new ideas.

BTAC (the initials of the British Transport Advisory Consortium) is a non profit making organisation. The annual "consult" conference raises funds to meet the costs of running the independent vehicle technical trials held for the last 25 years at MIRA, which is the British motor industry's proving ground near Nuneaton.

A test procedure has been developed that simulates both long-distance and stop-start conditions and is adaptable to represent other operational profiles if so required. The results are independently monitored.

In addition other performance measures have been developed such as:

- vehicle payload-earning factor;
- road holding and braking;
- noise (in- cab and drive - by)
- exhaust gas emissions.
- turning circles

In the main the evaluation is of devices and interventions claimed to enhance the fuel efficiency and cost effectiveness of the vehicle. This can range from different tyre types, lubricants, aerodynamics automatic v manual transmissions and more recently the issue of increased vehicle weights and load volumes.

The results of all of the evaluations are reported in the trade press and also quoted on many government papers concerning fuel efficiency and safety, both in the UK and around the world.

BTAC members have walked off with no less than four Motor Transport "Fleet Engineer Awards" namely John Eastman (Inchcape), Charlie Secker (Whitbread), Jim Smith (Bass) and Roger Denniss (Bass) for their contributions to the road transport industry.

The BTAC trials provide a quite exceptional source for gaining fleet performance data under controlled conditions at a very low cost.

Acknowledgements

This report covers the BTAC Technical Trials held at the Motor Industry Research Associations (MIRA) test facilities on the 3rd and 4th September 2005. This year BTAC had a considerable number of sponsors, without whose generous support the trials would not have been held. The sponsors were;

TPS Design Ltd (John Dickson Simpson)
38 Portobello Road, London W11 3DH

For the track costs and the summarised results

BP Fuels

For the supply of the fuel used.

Don -Bur (Bodies and Trailers) Ltd, Mossfield Road, Stoke on Trent (Richard Owen)

For the catering .

Central Weighing Ltd, Unit 142 Hartlebury trading estate, Kidderminster (Martin Parrack)

For the supply of both the vehicle weighing and fuel scales

Volvo Trucks and Bus Ltd. Wedgnock Lane, Warwick (John Comer)

For the supply of refreshments on the 3rd September.

Ford & Slater DAF Leicester, Narborough Road South, Leicester (Chris Hutt),

For the supply of the DAF Hospitality Unit.

Goodyear Dunlop Tyres UK Ltd., 88 Wingfoot Way, Birmingham

For the supply of the Goodyear Hospitality Unit.

Transport Engineer (David Wilcox and Tim Blakemore) and Transport News Digest (John Dickson-Simpson)

For the production of the commentary

LDV – Vehicles

For the supply of the mini bus.

In addition a number of BTAC members, and indeed non-members, gave their time freely, to carry out various tasks at the event. Without these people the event could not have been held. Particular thanks go to;

Roger Denniss, Martin Parrack, Andrew Davis, Kevin Atkins, John Dickson - Simpson, Barrie Hall, Nick Matthews, Kevin Taylor, Fred Richardson, Rae Denton , Tony Vandome, Bill Smith, Eddie Farley, Mick West, Dr.Paula Zard

Entrants

The following Companies entered vehicles in this year technical trials. The trials / interventions that were undertaken are listed on the individual results section.

1. Stan Robinson Haulage
2. Denby Transport
3. Silvertip Design /Morrisons / Don- Bur
4. Bandvulc
5. Fochesato
6. Exel
7. Royal Mail / IFED Super Tech
8. Lubrizol
9. Inchcape / Bridgestone
10. British Telecommunications
11. Royal Mail/Iveco
12. Angus Agencies

Stan Robinson , Denby Transport, Silvertip Design and Angus Agencies

Three trucks exceeding normal UK length and weight limits appeared side by side for the first time at the trials weekend. The fuel economy and productivity of each of the trio were soon to be closely examined, but first they were brought together on Mira's steering pad under the watchful eye of former Transport Engineer editor John Dickson-Simpson, also publisher and editor of Transport News Digest.

The main point of the steering-pad tests was to confirm whether any or all of these big rigs can comply with European Union turning-corridor rules.

As expected, top marks in this test went to the 16-metre semi-trailer with a clever self-steering bogie right at the back: the brainchild of Carl Henderson leader of Silvertip Design of Richmond, North Yorkshire. When this trailer (built by Don-Bur) made its public debut over five years ago (Transport Engineer February 2000) it had a tri-axle self-steering bogie following Ackermann geometry, courtesy of linkages between the trailer chassis and its turntable mounted bogie. The centre axle was removed by Morrison engineers for this year's BTAC trial, leaving a simpler self-steering wide-spread tandem-axle bogie. This tandem-axle configuration suits Morrisons, the big supermarket which provided a Daf three-axle tractor to test the Silvertip trailer's potential for improving vehicle productivity.

For the voluminous loads that prevail in supermarket transport 40 tonnes gross is adequate. This can be done with a tandem-axle semi-trailer if the tractor has three axles. However, the three-axle tractor requires more imposed load, which the rearward biased bogie of the Silvertip trailer provides.
For extra volume Morrison would prefer a long trailer to a double-deck because of faster turn round and the future potential to avoid load transfers

Coupled to a Morrisons Daf CF85.430 6x2 tractor to form an 18.75-metre rig, the Silvertip trailer stayed comfortably within the turning corridor, with trailer axles at least 2.4m outside the inner radius. The sideguard got a little closer but there was still 1.3m in hand. With 18 per cent greater deck-length than a conventional trailer and such good manoeuvrability, the single-deck Silvertip trailer looks a highly-productive proposition

At this year's trials the 25-metre B-double road train of Lincoln-based Denby Transport (Transport Engineer June and July 2004) had 0.31m to spare on the inner circle in the turning-corridor test. When the Denby articulated trailers were coupled to the steered tag-axle Scania tractor trialled by Angus Agencies, the outfit tracked around the 5.3m radius circle with 2.04m to spare. The Angus tractor turned more tightly because its virtual wheelbase was 770mm less, and because its coupling was 300mm behind the driving axle. The steering-tag configuration confirmed the good manoeuvrability experienced by Angus managing director Mark Cessford, although the coupling position does risk drive-axle overload. There is also usually a fundamental deterioration in lateral stability, but these days the anti-skid system overrides that.

Denby "B" Train

Angus Agencies

At around 31m long and without sophisticated steering axles on either trailer, the outfit assembled by Stafford haulier Stan Robinson could not hope to compete in the manoeuvrability stakes. It encroached into the 5.3m inner radius by over 2m. Mr Robinson's previous versions of this roadtrain at earlier BTAC events have been pulled by various tractive units at different gross weights: a 453hp MAN at 72 tonnes; a 523hp Scania at 80 tonnes; and a 445hp Caterpillar-engined Foden Alpha at 82 tonnes.

This year it was the turn of an MAN TGA 26.530 6x2 tractor, offering 523hp and the highest peak torque yet, 2,400Nm. At a shade under 82 tonnes gross, this truck returned 4.92mpg on the high-speed section of the BTAC test procedure, narrowly pipping the fuel economy of the Scania 144.530 at 80.3 tonnes gross four years ago.

Stan Robinson's big MAN TGA 26.530 tractor also completed the high-speed section pulling one trailer instead of two, at 43.2 tonnes gcw. Though payload was roughly halved, from around 58 to 28 tonnes, there was a 35 per cent reduction in the volume of fuel used. This ratio between payload and fuel use is a central plank in the argument for bigger and heavier trucks in the UK. The timing of this year's BTAC trials, a couple of months later than normal, could hardly have been better from the point of view of those making such points, with a Department for Transport decision on whether to allow road trials of longer trucks expected to be imminent.

As an adjunct to the standard-procedure trials Stan Robinson added some tests to compare fuel consumptions on a worst-case basis. Variables arising from differences in driving patterns were made minimal by driving at a continual 90 km/h. This does not reflect the give and take of normal operation – the purpose of the BTAC procedure – but Stan Robinson saw academic value for pure comparative purposes.

The Robinson tests comprised 12 laps of the MIRA high-speed circuit. Including the entry and exit the distance was 59.6km (37 miles). The 523hp MAN returned 41.49 litres/100km (6.805 mpg) at 42.62 tonnes gross with one trailer. It used 59.5 per cent more fuel in double-trailer configuration at 81.92 tonnes gross (101 per cent more payload) – 66.17 litres/100km or 4.265 mpg. That fuel consumption improved by 7.76 per cent, to 61.03 litres/100km (4.628 mpg) when the 12-lap run with the two Robinson trailers was hauled by the uprated, 718hp, Scania V8 with steered tag axle belonging to Angus Agencies – grossing 83.01 tonnes.

Compared with the 15-lap BTAC tests at three steady speeds that these outfits also did, the 90 km/h runs brought fuel consumptions that were, respectively, 9.8, 13 and 11 per cent heavier.

This year's tests with the Denby B-train and the Silvertip 16m semi-trailer (load volumes respectively of 144 and 107 cubic metre) concentrated on the economics when carrying low-density freight. The loads simulated pallets of potato crisps, at 66kg per cubic metre. Lightly loaded to this formula the Denby B-train grossed 33.24 tonnes and the Morrison hauled Silvertip 22.76 tonnes (700kg more than when the Denby tractor hauled a 13.6m tri-axle trailer carrying a load of similar density).

The fuel consumption of the Denby B-train was 31.93 litres per 100km (8.846 mpg) and of the 16m Silvertip was 25.61 litres/100km (11.029 mpg).

Per cubic metre of load and for every 100km the Denby B-train therefore consumed 0.2219 litres and the Silvertip 0.2382 litres. These translated into transport efficiency gains of 15.66 and 9.46 per cent respectively compared with the same density of load in a 13.6m semi-trailer of 91 cubic metres (grossing 22.06 tonnes with the Denby Scania tractor when the fuel consumption was 11.745 mpg).

In terms of pallet capacity compared with that of a 13.6m trailer the productivity of the B-train is 43 per cent better and of the Silvertip is 18.75 per cent better.

When the 16m Silvertip carried an 18.4-tonne load to give a gross weight of 33.52 tonnes – close to the 33.24 tonnes of the lightly loaded B-train – its Daf CF tractor returned 28.97 litres/100km (9.748 mpg) compared the 31.93 litres/100km (8.846 mpg) of the Scania B-train, which suffered a little more aerodynamic drag from the body of the second trailer which was a few inches taller than the body on the first, interlink, trailer.

With truck telemetry in the news as an HBOS/VOSA trial proceeds it was useful that a participant in the VOSA trial, RTL, Charlesworth, Derbyshire, compared telematics monitoring of the Robinson MAN fuel consumption. It indicated fuel five per cent better than those calculated by subtracting the weight of the fuel after the run from the opening weight and converting the result into a fuel volume. This sort of discrepancy is not unusual, according to RTL director James Fletcher. “Providing it is a constant off-set, as in this case, it can normally be explained,” he says. One source of variation was immediately obvious: the MAN’s system uses the tachograph feed for distance calculation and this indicated that the trial distance was 1.5 per cent longer than the BTAC standard figure from MIRA survey.

A notable fact to emerge from RTL’s initial analysis of the Stan Robinson runs was that the average load on the MAN’s engine was only 53 per cent, even when running at 82 tonnes. It averaged 44 per cent load with one trailer at 43 tonnes gcw. When a vehicle is rolling at constant speed on the flat MIRA track, its weight has reduced effect on torque demand, which is affected primarily by the kilograms of rolling resistance while the air drag stays comparatively similar between the vehicles.

Bandvulc Low energy remould tyres

Against a backdrop of proposed European standards for truck tyre noise and rolling resistance, Bandvulc has been looking at retread rolling resistance. Power-consumption tests on a two-metre-diameter drum in a laboratory are claimed to show that the first Bandvulc low-rolling-resistance wide-single (385/65 R22.5) trailer tyre had 17 per cent less rolling resistance than a comparable Michelin Energy Remix tyre.

It is reckoned that tyre rolling resistance accounts for 25-30 per cent of the energy needed to keep a laden five-axle artic rolling at 80km/h (50mph). So if the Bandvulc lab-test results were repeated across all axles one might expect fuel savings of around five per cent.

Running only on the high-speed section of the BTAC test procedure, a Renault Premium 420dCi 4x2 tractor from the Bandvulc fleet was tested first with Michelin Remix (retread) Energy tyres (XDA2 on the drive axle, XTA2 on the trailer). Then it was the turn of the under-development Bandvulc tyres. The tractor's steer-axle tyres (not remoulds) were unchanged throughout. Steer-axle tyres contribute around 15 per cent of a five-axle artic's rolling resistance, so Bandvulc's theoretical target in this Mira test was a fuel economy gain of around four per cent.

Bandvulc engineer Peter Pritchard took care to make the test as fair and reliable as possible. All casings came from Michelin Energy tyres, and the Bandvulc retreads were buffed to match the shallower tread of the Michelin Energy tyres. The mentor for this series of tests also ensured that tyre pressures where the same for both sets of runs.

Bandvulc director Richard O'Connell is delighted with the trial result: a 4.96 per cent fuel-saving. The fact that this exceeds the theoretical gain is probably the result of the driver needing to become accustomed to the procedure (as most do) and of a slightly lower average speed on the second run.

Mr. O'Connell and Mr Pritchard recorded that their trailer retreads were rather cooler than the Michelins after the track tests, as they had been after the lab tests. "Heat is a fundamental enemy of tyres," says Mr O"Connell. "So this is another positive result." He emphasises, however, that it will take at least another six months to bring these new low rolling-resistance tyres to market. "We need to do more trials to confirm we have a roadworthy compound," he explains. "We have to check that we are not going get tread-chunking on the drive-axle, which is something that some low-rolling-resistance tyres are prone to. Because our compound seems to have a fuel advantage over Michelin Energy Remixes, we will probably use that to increase tread depth up to our usual figure and yet still be able to match the Michelins on rolling-resistance."

Fochesato – Engine power re-mapping

Whenever truck gross weight limits are lifted, operators have to decide which power and torque ratings best suit the new limits and their own vehicles' work patterns. Higher power outputs are sure to please drivers and anyone with an eye on residual values, but do they make sense at the fuel pump?
Mark Penney hopes to persuade truck operators that reprogramming the chip at the heart of an engine's ecu (electronic control unit) will not only extract more power and torque but will also deliver better fuel economy, even without any final-drive ratio change.

A year ago Mr. Penney, a former fund manager, bought the rights to become sole UK agent for the France-based Fochesato chip reprogramming service for trucks, cars, buses and coaches. Fochesato (UK) is based in Ascot, Berkshire.

Mr Penney likes to draw a distinction between the service he offers and other chip upgrades. "Ours is not a one-size-fits-all approach or a replacement chip," he says. "We look at the chip from your particular vehicle and Mr Fochesato himself personally reprograms it."

Bruno Fochesato used to be a race-car engineer. Ten years ago he went into chip reprogramming in France, first for competition cars and more recently for road-going cars and commercial vehicles. Mr. Fochesato has so far re-programmed 8,000 vehicles (including 1,000 trucks), according to Mr. Penney.
A Scania 380hp 114 tractor belonging to Stafford-based haulier Stan Robinson was given the Fochesato treatment at this year's BTAC trials weekend. Pulling a tri-axle semi-trailer and running above the normal UK weight limit at 42.1 tonnes gcw, the Scania ran first as its maker intended, at a nominal 380hp and 1,800Nm. Then Mr. Fochesato in France e-mailed a resetting. It is not a cheap process. List prices for reprogramming truck engines range from £1,730 to £2,100. This is said to buy an extra 50-70hp and 250-300Nm. Proportionally the percentages of claimed power and torque gains look curiously consistent across a wide variety of vehicles, ranging from an Iveco Daily van to a Volvo FH16 tractive unit. In the BTAC tests comparing a standard and reprogrammed Scania, although the average speed was a touch faster following reprogramming, consumption was little different – 8.647mpg at reprogrammed 436hp compared with 8.691 at standard 380hp. Mr. Penney contends that a trial including hilly terrain and changing engine loads, calling for more use of gears, would have shown a fuel economy improvement from the reprogrammed engine. How would Mr. Penney allay truck operator worries on subjects such as engine reliability and manufacturer warranty limitations? He insists that there has been not a single engine failure among the 8,000 reprogrammed to date by Fochesato. Some time in the future there could be an obstacle in the form of on-board recording of exhaust emissions.

Exel – Aerodynamics

"Everybody knows that air-deflectors work with boxes or curtain-siders, but we frankly hadn't a clue with these bulk tankers." This succinct explanation for the presence at this year's BTAC trials of a Rank Hovis flour tanker semi-trailer pulled by a Daf CF85 6x2 tractive unit comes from Barrie Hall, engineering operations manager at Exel's special products and industrial divisions.

Exel runs a fleet of flour bulkers for Rank Hovis under a five-year contract. So tall were the Scania tractors previously used on this contract that roof-mounted air-deflectors were not considered. But a quest for extra payload led Exel to the latest Daf CF85.430 FTP 6x2 tractor. This has tiny (17.5-inch) wheels on the mid-lift axle and is claimed to be the lightest three-axle tractor on the market (7.82 tonnes including cargo-discharge blower). But the standard CF sleeper cab is lower than the Scania's. So Mr. Hall wanted to determine the fuel-saving potential of adding an air-deflector, set against its cost (about £1,300 net, with side deflectors) and a payload weight penalty of about 100kg.

The nose of the new 58-cubic metre Feldbinder trailer is shapely enough and not particularly high, but the access ladder on the front, the catwalk down the top, the tipping ram and the wide cab-gap towards the top of the tank suggest sub-standard aerodynamic efficiency. Using fuel consumption figures generated by the Daf's on-board computer (Mr. Hall was focusing on the difference in consumption rather than absolute figures) the trial comprised a series of hour-long sessions lapping the Mira track at a steady 65km/h (40mph) and 90km/h (56mph), first without and then with the air-deflector, set in its lowest position.

A final run was made at 90km/h with the deflector set higher, on the fourth hole in the adjustable bracket. Mr Hall is pleased with the results. They point to fuel-savings of 10.96 per cent at the higher speed and 2.15 per cent at the slower speed. “They prove that there is a significant benefit from looking at the aerodynamics,” he says. The figures suggest that the optimum position for the deflector may be somewhere in between the two settings, so it has now been re-set to the third hole and is back in service while Mr. Hall works out the economics. Five of these Daf tractors are currently in service on the Rank Hovis contract, covering up to 190,000km a year.

The final results are as below;

Test profile	Speed	Distance	MPG	Wind Speed
Test 1 (deflector at lowest position)	40MPH	28 miles	9.9	9.3
Test 2 (deflector at lowest position)	56MPH	28 miles	7.7	9.5
Test 3 (deflector removed)	40MPH	28 miles	8.9	9.1
Test 4 (deflector removed)	56MPH	28 miles	7.3	10.2
Test 5 (deflector removed)	40MPH	42 miles	9.3	7.4
Test 6 (deflector removed)	56MPH	42 miles	7.3	10.2
Test 7 (deflector at lowest position)	40MPH	42 miles	9.5	14.2
Test 8 (deflector at lowest position)	56MPH	42 miles	8.1	11.3
Test 9 (deflector raised to position 4)	56MPH	42 miles	8.1	17.3

Two years ago Mr. Hall came to the BTAC trials to measure the effect on fuel consumption of a truck’s air-conditioning (Transport Engineer July 2003). The penalty – virtually nil – persuaded Exel to specify air-conditioning thereafter, but this time Mr Hall says the decision is not so clear-cut. “Instead of fitting air-deflectors, we could specify the Space Cab instead of the standard sleeper,” he reasons. “It would give us the extra height, but probably wouldn’t be as aerodynamic as the deflector. It would cost about £2,000 but it would help residuals. We need to compare the weights too, so we’ve got some more work to do. But this trial showed there is scope for improvement. That’s why we come to the trials – there’s a good business case to be here.”

Royal Mail - IFED

Allan van As is the South African managing director of IFED (Integrated Fuel Economy Device), a company he set up last year in Watford, Hertfordshire to be sole UK and Irish Republic distributor of something called Super Tech. With its perforated ceramic casing and cylindrical shape, this looks like a slender oil- or air-filter element but is described by Mr. van As, whose background is in the legal profession, as “the world’s first proven in-tank catalyst, able to reduce emissions while vastly improving fuel consumption without adding anything to the fuel itself.”

The Super Tech tube is suspended in a vehicle's fuel tank (diesel or petrol), hanging from the filler neck so that one end rests on the base of the tank, leaving the other end to sway about as the vehicle moves. This movement is important, according to Mr van As, because it "enhances emission of far infrared electro-magnetic waves from the Super Tech into the fuel." A copper cable runs through a series of ceramic sleeves and permanent-magnet discs. No power supply is needed, yet the effect is claimed to weaken the molecular bonding between hydrocarbon molecules in the fuel, thus apparently making then more easily combustible with the air in the combustion chamber. UK transport engineers are sure to treat such claims with scepticism but the device's inventors (an Italian and a Korean) insist that the result is fewer unburnt hydrocarbons, lower emissions and better fuel economy. The BTAC tests could only examine a fuel-consumption comparison.

Mr van As cites numerous reports referring to emissions cuts as great as 60-75 per cent and fuel consumption improvements in the order of 10 per cent. But many of these reports come from countries with less demanding emissions limits and high-sulphur fuel. A more recent study by a Hong Kong university on a Euro-3 engine running on ultra-low-sulphur fuel is said to have found a 3.7 per cent fuel saving. This is the sort of saving Mr. van As expects his Super Tech to give UK operators.

Royal Mail's fleet technical manager Kevin Atkins decided to test the Super Tech at this year's BTAC trials in a pair of brand-new Daf 45.130 7.5-tonners, both similarly part-loaded. Each truck was run with and without the device on both the high-speed and stop-start sections of the BTAC test procedure.

Results from one vehicle are hard to explain because they suggest first an improvement and then a deterioration in fuel consumption in the two trial sections. The picture is further confused by poorly-controlled running speed in this test. But results from the other vehicle hang together better, pointing to an apparent 1.61 per cent total improvement in fuel economy over the two test sections: a long way short of the figures expected by IFED. "I was looking for five per cent," admits Mr van As. "The device produces better results on older vehicles with harder-working engines", he claims "An improvement of over one and a half per cent still produces a pay-back." The small Super Tech used in the LF45's tank has a list price of £235. A larger one for a tractive unit fuel tank costs£390.

Lubrizol- modified viscosity lubricants

At last year's BTAC trials Lubrizol, the Belper, Derbyshire-based supplier of lubricant additives to several well-known oil companies, ran practical tests in support of its laboratory work on engine, gearbox and drive-axle oils. The results were usefully positive. Lubrizol field test engineer Kieron Donnelly was back this year with an even more sharply-focused test programme designed to substantiate the fuel-saving potential of two low-viscosity (5W-30) engine oils compared with 15W-40 reference oil.

The two 5W-30 additive packs are in the final stages of their development. Mr Donnelly was hoping the Mira tests would verify chassis dynamometer work which pointed to a fuel saving of two per cent from oil B compared with reference oil A, and a three per cent saving from oil C, which boasts superior friction modifiers.

Painstaking as ever, Mr. Donnelly this year ran the full BTAC test procedure (high-speed and stop-start sections) twice for all three oils. A 420hp Volvo FH12 tractor and trailer loaded to 38 tonnes gcw was used for all runs, always piloted by an experienced Mira test driver, Graham Read. “The driver is the key to the success of this,” says Mr Donnelly. “He has to be switched on and concentrating for every second of every lap to get the consistency you need.” Mr. Read did not disappoint, delivering some of the most consistent running speeds of the whole weekend. Only the final run of six was slightly out of line.

As expected, oil B’s lower viscosity translated into a two per cent fuel economy improvement over reference oil A. “You could probably double that if you factored in cold starts,” reckons Mr Donnelly. But he was disappointed with the results from oil C, which failed to deliver the hoped-for further one per cent gain. A higher average speed and changing weather conditions are seen as the flies in the ointment here. Mira’s weather station report shows that air temperature rose and barometric pressure fell considerably between the oil A and oil C runs. Conscious that inlet air temperature and mass sensors will have detected these changes and adjusted the engine’s management system accordingly, Mr. Donnelly fears that too much variance has been introduced for a completely reliable view of oil C.

Inchcape / Bridgestone - Compressed air v nitrogen

A Volvo FM12 hauled experiment was conducted at 33 tonnes gross on an Inchcape Automotive car transporter with Bridgestone tyres inflated with nitrogen instead of air – a practice in motor racing to subdue temperature build-up. The nitrogen generation and inflation plant, supplied by Parker Filtration and Separation, at Etten-Leur in the Netherlands, is compact – only three-quarters of a metre tall. Representatives at the BTAC trials estimated that it costs about £6 a tyre to fill with nitrogen.

The hope was to demonstrate a saving in fuel consumption, but the hope was dashed, mainly because of unfortunate deviations in distances and speeds, making the data inadmissible for drawing reliable conclusions. The results were:

Run 1, with the tyres inflated with compressed air as normal, the vehicle returned 7.66 mpg. Run 2, with the tyres inflated with nitrogen, was completed at 5.35 mph faster than the reference run 1, and the vehicle returned 7.61 mpg.

Advantages can be expected from nitrogen because it stops gas migration through rubber, gives long-term pressure retention and eliminates interior oxidation. Such benefits are long-term, however, and were beyond the scope of the BTAC trials.

British Telecommunications - Tyre Inflation

BT entered a Vauxhall Vivaro van laden to 2.8 tonnes. The test objectives were to test the effects of tyre pressures on fuel consumption, running the pressures at the manufacturers recommend figure, followed by tyres 20% under inflated and then 20% over inflated.

The most reliable of the results, obtained on a multi –stop simulation, revealed a 2.4 per cent better economy with hard tyres and a 2.4 per cent worse with soft tyres. Speed during two of the tests was the controlling factor.

The results obtained are as follows;

Run 1 Tyres at the correct pressure, overall MPG 39.31
Run 2 Tyres 20% over inflated, overall MPG 41.48
Run 3 Tyres 20% under inflated, overall MPG 40.52

Royal Mail – Effects of limiting top speed

Royal Mail evaluated the fuel consumption effect there will be when a European Union directive forces 90 Km/h speed limits on commercial vehicles grossing more than 3.5 tonnes (the current limit is 12 tonnes).

Figures after exchanging drivers between the two Daf box vans, grossing 5.35 tonnes, indicated that at a steady speed of 56 mph the fuel consumption was nearly 19% better than at a steady 70 mph. This almost mirrors similar tests carried out at the technical trials in 2004.

Royal Mail automatic v manual transmission

Royal Mail entered two Iveco Daily Turbo vans, plated at 3.5 tonnes to compare manual and automatic transmissions. The test showed a 6% improvement in fuel consumption in favour of the vehicle equipped with automatic transmission.

During the course of the four runs drivers were interchanged. More in service trials will be required to prove the cost effectiveness in terms of whole life costings for this type of operation

BTAC Technical Trials Results 2005

DOUBLE TRAILER COMBINATIONS

Tractor	Gross tonnes	Load tonnes	Fuel L/100Km	L/100Km /t load	MPG	Operator
530hp MAN	81.92	54.21	57.45	1.06	4.916	Stan Robinson
718hp Scania	83.01	54.21	54.23	1.00	5.209	Angus Agnecies
480hp Scania	59.12	34.68	43.67	1.26	6.496	Denby Transport
(Ref: 428hp Daf	42.86	27.78	38.70	1.39	7.300	Exel Logistics)

COMBINATIONS WITH LOW-DENSITY LOADS (66Kg/cu.m)

Tractor	Trailer	Gross tonnes	Volume cu.m	Fuel L/100Km	L/100Km /cu m	
420hp Scania	13.6 m Fruehauf	22.06	91.4	24.05	0.2631	Denby Transport
428hp Daf	16.1 m Don-Bur	22.76	107.5	25.61	0.2382	Morrisons
420hp Scania	7.82+13.6m B-train	33.24	143.9	31.93	0.2219	Denby Transport

EFFECT OF ENGINE MANAGEMENT CHANGE

Tractor	Gross tonnes	Load tonnes	Fuel L/100Km	L/100Km /t load	MPG	Operator
Scania at 380hp	42.1	26.92	32.50	1.207	8.691	Stan Robinson
Scania at 436hp	42.1	26.92	32.67	1.214	8.647	Fochesato

EFFECT OF LOW ROLLING RESISTANCE REMOULDS

Tractor	Gross tonnes	Load tonnes	Fuel L/100Km	L/100Km /t load	MPG	Operator
415hp Renault/Michelin	26.	12	31.39	2.613	8.968	Bandvulc
415hp Renault/Bandvulc	26.	12	29.88	2.490	9.455	Bandvulc

ECONOMY PROSPECTS OF SPEED LIMITERS

Nominal constant speed	Gross tonnes	Fuel L/100Km	MPG	Average Km/h	Operator
70mph	5.36	19.73	14.31	115	Royal Mail
56mph	5.36	16.01	17.63	92.6	(Two Daf 45s)

EFFECT OF A FUEL CATALYSER

	Gross tonnes	Fuel L/100Km	MPG	Average Km/h	Operator
NO fuel cat	5.36	13.567	20.82	56.43	Royal Mail
WITH Fuel cat	5.36	13.246	21.32	53.72	(Two Daf 45s)

POWER ECONOMICS

Tractor	Gross tonnes	Load tonnes	Fuel L/100Km	L/100Km /t load	MPG	Trailer
380hp Scania	42.10	26.92	32.50	1.207	8.691	Tri-axle curtain
428hp Daf	35.52	18.50	28.97	1.566	9.748	Steering tandam
480hp Scania	41.95	24.57	33.65	1.370	8.394	Tri-axle curtain
530hp MAN	42.62	26.92	37.43	1.390	7.547	Tri-axle curtain
718hp Scania	43.78	27.08	36.61	1.352	7.716	Tri-axle tipper

AUTOMATIC VERSUS MANUAL GEARING

	Gross tonnes	Fuel L/100Km	MPG	Average Km/h	
Iveco Daily manual	3.62	8.929	31.61	56.43	Royal Mail
Iveco Daily automatic	3.52	8.366	33.74	54.82	

EFFECTS OF TYRE PRESSURE

Tyre pressure status	Litres/100km	MPG	
20 per cent overinflated	6.810	41.47	BT Vivaro van at
20 per cent underinflated	6.971	40.53	2.84 tonnes gross

MANOEUVRABILITY

	When swinging 12.5m outer- radius Inner turning radius(m)	Turning corridor width(m)
18m Daf 85 steer-mid + steering tandem	7.705	4.795
16m Scania 164 steer-tag +tri-axle	5.765	6.735
16m Scania 124 steer-mid +tri-axle	5.660	6.840
25m Scania 164 steer-tag B-train	7.340	5.160
25m Scania 164 steer-mid B-train	5.160	6.890
31m MAN TGA steer-mid + double tri-axle	3.130	9.370