Sobering results from sheets-to-the wind tests

There cannot be much doubt about the main function of tipper-body sheeting systems. Whether powered or manually-operated, they are designed to stop loose material and dust escaping. Sheeting an empty body would seem to be a waste of time. But it is suggested that this can bring a worthwhile gain in aerodynamic efficiency that can translate into a substantial fuel economy benefit. The trouble has been that nobody could produce any reliable experimental data to support the claim or refute it. Now they can.

At the technical trials run two months ago by the Brewery Transport Advisory Committee (BTAC) and IRTE at the Motor Industry Research Association proving ground near Nuneaton (Transport Engineer July) Michael Coyle from Huddersfield University set out to establish what fuel consumption penalty, if any, results from leaving an empty tipper body unsheeted.

He used a tipping tri-axle semi-trailer, with alloy planked body, on loan from its manufacturer, SDC. The trailer's sheeting system, also supplied by SDC, is manually wound from ground level to go over the body nearside to offside. The option costs about £1,100. Figure 1 shows the trailer with the easysheet closed.

Figure 1 Trailer with easysheet closed

The tractive unit borrowed by Mr Coyle for the test is a 4x2 Renault Magnum 420, owned by ETSU, the Energy Technology Support Unit, which runs the Department of the Environment Transport and the Regions' energy efficiency best practice programme. The Magnum normally pulls the display trailer owned by Leicester Energy Agency, a partnership between Leicester City Council and the local De Montfort University offering advice and training in "energy awareness". Total unladen weight of the Magnum/SDC rig is 14.66 tonnes.

Mr Coyle's first test run a MIRA was with the roll-over sheet closed to stop air flowing into the tipper's body. Five laps of the track were completed at a constant 60km/hr (37mph). Then five laps were run at 80km/hr (50mph) followed by five more at 90km/hr (56mph), making a total test distance of 41.74 miles. Fuel consumption was measured with an on-board AIC flow meter.

Then the tipper's sheet was retracted and the whole process repeated to produce a parallel set of fuel consumption figures. Many people would have been happy to end the trial at this point. Not Mr Coyle.

He then proceeded to repeat the first set of tests with the sheet closed. He wanted to establish the mean of two sets of sheet-closed results because this lessens what he calls "the familiarity effect": fuel economy often improves in a second set of tests simply because the driver is more accustomed to driving on the track. Taking the average of two sets of results also helps to lessen the impact of variables such as changing engine temperatures and wind speeds.

The results of Mr Coyle's tests confirm that sheeting an empty tipper body does indeed improve fuel economy by reducing wind drag, and that this effect grows as speed rises. Even with a cab as tall as the Renault Magnum's, the fuel saving at higher speeds is considerable.

BODY OPEN				BODY CLOSED		
Speed (mph)	**Distance (miles)**	**Fuel (gallons)**	**Consumption (mpg)**	**Fuel (gallons)**	**Consumption (mpg)**	**Difference**
37	13.914	0.977	14.248	0.961	14.479	1.64%
50	13.914	1.489	9.345	1.378	10.097	7.45%
56	13.914	1.622	8.577	1.471	9.459	9.31%
Total	41.741	4.088	10.212	3.810	10.956	6.80%

Drivers and operators may baulk at the idea of winding a sheet across an empty body for a short, low-speed trip back for another load, and they probably would be right to do so because any fuel saving would be infinitesimal. But if the unladen trip involves a fair amount of dual-carriageway of motorway, then the sums change and the time taken to operate the sheeting system would be rewarded amply.

With the proportion of empty running in the entire UK road haulage industry estimated at 25-30 per cent of total mileage, there must be considerable scope for saving fuel simply by sheeting empty tipper bodies.

Mr Coyle says: " I didn't have any preconceptions about the figures. The gradual improvement in the savings as the speed increased is no surprise, but at least we now have some concrete figures."

His results tie in with those of previous tests aimed at relating the aerodynamic drag of trucks to speed. Iveco Ford ran track tests at MIRA several years ago to assess the value of an air-management kit on a 190.36 Tectractive unit. At 40mph the kit generated a fuel saving of 5.8 per cent, but at 50mph it was up to 8.4 per cent, reaching 10.5 per cent at 60mph. A rule of thumb is that about half a truck's power output is needed to overcome air resistance at 55-60mph. At 40mph, that proportion falls to around a third.