IN THE CORONERS COURT
OF VICTORIA
AT MELBOURNE

Court Reference: COR 2007 3914

FINDING INTO DEATH WITH INQUEST

Form 37 Rule 60(1)
*Section 67 of the **Coroners Act 2008***

Inquest into the Death of: GRAEME ANDREW DUNN

Delivered On:	13 August 2013
Delivered At:	Coroners Court of Victoria Level 11, 222 Exhibition Street, Melbourne 3000
Hearing Dates:	13 to 15 October 2010
Findings of:	JANE HENDTLASS, CORONER
Representation:	MR A. PALMER appeared on behalf of Meritor. MR T. WRAIGHT appeared on behalf of WorkSafe. MR N. MURDOCH appeared on behalf of Iveco Trucks. MR G. BURNS appeared on behalf of Traianon Transport. MR R. O'NEILL appeared on behalf of Raymond Davies
Police Coronial Support Unit	SENIOR CONSTABLE G. McFARLANE was present to assist the Coroner.

I, JANE HENDTLASS, Coroner having investigated the death of GRAEME ANDREW DUNN

AND having held an inquest in relation to this death on 13 to 15 October 2010

at MELBOURNE

find that the identity of the deceased was GRAEME ANDREW DUNN

aged 52 years

and the death occurred on 1 October 2007

at a reserve beside the Melbourne Road off exit ramp from the Westgate Freeway, 200 metres west of the intersection of Williamstown Road.

from:

1 (a) **Chest injuries**

in the following circumstances:

1. Graeme Andrew Dunn was 52 years old when he died. He lived with his wife, Nola Dunn, and their children at 96 Reed Court in Rockbank.

2. Mr Dunn worked as a self employed contractor for VicRoads. On 1 October 2007, he was driving a ride-on mower in a reserve beside the Melbourne Road off exit ramp from the Westgate Freeway, 200 metres west of the intersection of Williamstown Road.

3. At about 1:15pm on 1 October 2007, Raymond Davies[1] was driving a semi-trailer with a 1988 International S-Line 2670 prime mover chassis number T00046 ("Mr Davies' prime mover") towards the City on the Westgate Freeway. Traianon Transport Pty Ltd owned the semi-trailer and employed Mr Davies as a driver.

4. In 2007, Mr Davies was the only driver allocated to drive the prime mover.

5. As the semi-trailer was travelling towards the Melbourne Road exit ramp in the second lane from the median on the five-lane Millers Road overpass on the Westgate Freeway, the dual wheel, hub, axle and part of the fractured axle housing broke away from the right forward drive axle on Mr Davies' prime mover.

[1] Mr Davies was excused from giving further evidence.

6. The detached dual wheel, hub, axle and part of the fractured right forward drive axle housing from Mr Davies' prime mover travelled intact parallel to the truck for about 500 metres before it hit the centre concrete barrier, rolled left in front of the still mobile semi-trailer across four city-bound lanes of vehicles, collided with an upright traffic sign and became airborne.

7. The dual wheel, hub, axle and part of the fractured axle housing of Mr Davies' prime mover remained in the air for 81 metres. In that distance, it jumped a single lane of vehicles on the exit ramp and the guard rails before it hit Mr Dunn.

8. Mr Dunn was hit on the back of the head by the dual wheel, hub, axle and part of the fractured axle housing from Mr Davies' prime mover. The momentum of the axle forced him on to the ground from his ride-on mower.

9. Mr Dunn lost consciousness immediately and died at the scene.

10. The forensic pathologist who inspected the body and the post mortem CT scans formed the opinion that a reasonable cause of death in the circumstances was chest injuries involving massive left haemothorax, right pneumothorax, multiple fractured ribs and chest injuries. The right femur was also fractured.

11. Accordingly, I find that Graeme Dunn died from chest injuries.

12. The coronial investigation of Mr Dunn's death proceeded under the *Coroners Act* 1985.

13. There is no suggestion that Mr Dunn or his mower in any way contributed to his death. Accordingly, this coronial investigation of the circumstances of Mr Dunn's death has necessarily focussed on the semi-trailer and, in particular, Mr Davies' prime mover and the right forward drive axle of this prime mover.

14. This finding will review the evidence in relation to:

- Traianon Transport Pty Ltd;
- Mr Davies' prime mover;
- The oil leaks from the right forward drive wheel of Mr Davies' prime mover;
- Fracture of the right forward drive axle of Mr Davies' prime mover on 1 October 2007; and

- The relevant legislation.

15. It will then comment and make recommendations intended to prevent further deaths occurring for the reasons that Mr Dunn died.

Traianon Transport Pty Ltd

16. Traianon Transport Pty Ltd ("Traianon") was a small transport company operating about 12 interstate and local haulage trucks out of their premises at 11 Grant Street in Bacchus Marsh.

17. Arthur and Leanne Traianon owned and ran the Traianon business. Their two sons, Peter and Anthony Traianon, also worked in the business and they employed six other people.[2]

18. Peter Traianon managed the fleet, the workshop and the local drivers. He and Anthony Traianon also performed the general maintenance work but Anthony Traianon drove most of the time.

19. Accordingly, Peter Traianon was responsible for allocating work and vehicles to the drivers including Mr Davies.

20. All servicing of Traianon trucks was done at their depot, apart from major servicing such as engine work and warranty work which was sent out to Cummins South Pacific Pty Ltd and Iveco.

21. Drivers working for Traianon reported any problems with their trucks to Peter Traianon or on a white board in the work shop or on their daily run sheets. These run sheets were handed in to Mrs Traianon and she reported faults to Peter Traianon.

22. Peter Traianon explained:

> *"If it's urgent and needs to be done straight away it is done straight away. If it's minor and nothing dangerous it waits until the weekend."*

23. Peter Traianon and Anthony Traianon were not qualified mechanics but they had extensive experience working with Traianon's trucks.

24. In his statement prepared for WorkCover, Peter Traianon said:

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[2] Arthur, Leanne, Peter and Anthony Traianon were all excused from giving evidence.

"I do not have any mechanical qualifications but I have learnt to do mechanical repairs from being taught by mechanics that have worked at Traianon and by watching Dad. I know how to do servicing, greasing, brake relines, wheel seals and anything general."

25. If either Peter Traianon or Anthony Traianon was unsure about how to perform their maintenance work, they contacted Robin Harbridge or Lindsey Nash.

26. In his statement prepared for WorkCover, Anthony Traianon said:

"Peter does most of the basic work on the trucks. I help out when I'm here. Peter is also not a mechanic but has the same experience as me. If there is any mechanical work that we're unsure of, I ring Robin Harbridge (a mechanic) to provide advice and sometimes do the work. We also sometimes ring Lindsey Nash (a mechanic). Lindsey and Robin would give advice for this work very rarely. We pretty much know what to do and do most of the work ourselves. They probably come in and work two to three times a month.... Local trucks are serviced around once a month"

27. Robin Harbridge was a qualified maintenance fitter with 23 years experience. He explained that a maintenance fitter was similar to a motor mechanic but he worked on heavy vehicles rather than cars. He had worked part time for Traianon for over 20 years. Traianon paid Mr Harbridge for his work on an hourly basis.

28. Lindsey Nash was a qualified road transport diesel mechanic with 14 years experience. Traianon did not pay Mr Nash for his advice but he parked his car in their yard. However, Traianon had employed Mr Nash for six months in about 2002. At that time, he was responsible for maintenance of the prime mover.

29. Neither Peter Traianon nor Anthony Traianon had ever read the International S Series Operators Manual published by International Harvester Australia Ltd. (the "Operators Manual").

30. Peter Traianon also said:

"Traianon Transport does not have the manufacturer's service books or manual for all their trucks. The newer trucks probably would. The servicing isn't done by looking at the manufacturer's books. It's just a general service. I couldn't tell you if 'DVG 257' has a manufacturer's book or manual. I have never seen one for that truck."

31. Anthony Traianon also said:

> *"I know that some trucks have a manufacturer's service book or manual but we don't use these for servicing.*
>
> *When a truck goes into the shed we look at everything. We hop under it and check the shaft by shaking it. If something is broken you would see it. You wouldn't see the cracks in metal unless it was clearly obvious by something having moved."*

32. Therefore, I assume that neither Mr Harbridge nor Mr Nash had routine access to the Operators Manual when they provided Traianon with advice and assistance.

Mr Davies' Prime Mover

33. Mr Davies had been driving trucks for just over 20 years. He had been employed as a full time driver by Traianon for five years. During that time, he drove locally and nearly always drove the same prime mover.

34. Mr Davies also told the Court that Peter Traianon was his "boss". He rang Mr Traianon for direction about which work he should perform and when any issues arose.

35. Mr Davies always performed a visual inspection of his truck before he commenced work, including looking for oil leaks.

36. However, Mr Davies had very little experience with maintenance of trucks. He told the Court he sometimes did some greasing. He also said he performed other minor maintenance tasks:

> *"Just replacing globes or lights from the trailer, stuff like that....*
>
> *Anything more complicated, Peter or Anthony would repair it."*

37. The semi-trailer driven by Mr Davies on 1 October 2007 consisted of a 1988 International S-Line 2670 prime mover chassis number T00046 (" Mr Davies' prime mover") and a Freighter Tautliner trailer.[3]

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[3] I note that Traianon submits it acquired the prime mover in 1986. However, this is inconsistent with all other evidence about the semi-trailer involved in Mr Dunn's death.

38. Mr Davies' prime mover was first registered in Victoria on 15 May 1989.[4] The registered vehicle operator was Arthur Traianon. The maximum load specified on the manufacturer's compliance plate was 22.50 tonnes.

39. In 2007, Mr Davies was the only driver of the prime mover. He told the Court that the truck would normally carry close to maximum loads.

40. Mr Davies' prime mover was manufactured by International Trucks ("International") in Dandenong which was a subsidiary of International Harvester Australia Ltd. In 1992, Iveco Trucks ("Iveco") purchased International Harvester Australia Ltd. In 2001, Iveco changed its name to Iveco Trucks Australia Ltd. Iveco was a division of Fiat of Italy.

41. International and its subsequent owners manufactured 2993 International S-Line 2670 prime movers between 1979 and 1999.

42. The Court heard that S-Line prime movers generally had a first life of 4 to 5 years or 800,000 to 1,000,000 kilometres before they required major repair or replacement of major items. Older trucks generally have more limited use in yards, short haul and farm or tipper applications.

43. Rockwell Standard of Australia Ltd ("Rockwell") supplied International with the axles and axle housings they fitted to their 1988 International S-Line 2670 prime movers. Meritor Heavy Vehicle Systems Australia Ltd ("Meritor") has since taken over Rockwell. Meritor is a division of ArvinMeritor in the United States.

44. The SP40 axle was designed and manufactured by ArvinMeritor in the United States.

45. Between 1979 and 1990, ArvinMeritor supplied the SP40 axle to International complete but for brake groups and hub assemblies for direct assembly into the truck: "spindle to spindle". This means that all the original welding on the axle housing was completed by ArvinMeritor prior to delivery to International.

46. Between 1979 and 1993, International included about 8500 SP40 axles in their trucks. They have no record of any other SP40 axles failing in this manner.

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[4] I have used the date of registration as the date the semi-trailer was first used by Traianon. I have calculated other dates from this date of registration.

47. Iveco records indicate that the forward rear axle of the prime mover when it was manufactured was an SP40 axle with the gear ratio/serial number 8719594954. This axle remained in place at the time of the incident and is the axle that fractured.

48. Through his Counsel, Arthur Traianon told the Court that Mr Davies' prime mover had been involved in two separate motor vehicle collisions in its first year of operation, that is in or about 1989/90:

- In one incident, it drove off the side of the road. It did not roll over.[5]
- The other incident involved a rollover. One of the chassis rails in the prime mover was replaced as a result. Senior Sergeant Robert Le Guier from the Victoria Police Major Collision Investigation Unit confirmed that this incident was not inconsistent with the prime mover also sustaining damage to the axle. Other witnesses agreed.

49. Mr Harbridge remembered that Mr Davies' prime mover was extensively damaged in one of these two incidents. He told the Court:

> *"Well, apparently one of them it was fairly extensively damaged 'cause I remember the repair crew had it for a long time.*
>
> *I think on one of them there was a chassis rail replaced because it - the crash was fairly extensive."*

50. Dr John Price[6] confirmed that the damage to the right forward drive axle in the more serious incident was severe but did not completely sever the axle. He told the Court:

> *"It's pretty deep. I mean, it's a fairly big weld - it's - so it may have affected the inside of the axle... I don't think it broke because I don't think the top of it's been damaged."*

51. Dr Price presumed that repairs of this type reflected visible cracking at the edge of the inboard brake adaptor weld and perhaps some small distortion of the axle housing.

52. Arthur Traianon remembered that Traianon's insurance company arranged for "Royans" to undertake the repairs following both these two incidents.[7]

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[5] Transcript 14 December 2009, p. 5; transcript 14 October 2010, p. 38.
[6] Dr John Price is a mechanical and materials engineer. Meritor obtained an expert opinion from Dr Price.

53. William Andrews is the Managing Director of Royans Wagga Pty Ltd. In a letter dated 26 October 2010, Mr Andrews told the Court that he had been working for Royans Wagga Pty Ltd since 1983. Mr Andrews remembered the name Arthur Traianon and that he did some insurance repairs for him. However, his records have been destroyed and Mr Andrews cannot confirm or deny that they ever did repairs on Mr Davies' prime mover.

54. Mr Andrews also told the Court:

> *"The welding of a plate onto the near side drive axle differential housing is something that is most unlikely to have occurred at Royans Wagga..(it) sounds more like a backyard repair that occurred sometime in the vehicle's history."* [8]

55. Mr Andrews' memory is consistent with Arthur Traianon's memory that remediation work on the prime mover was performed by Royans in New South Wales.

56. If he remembered performing this work for Arthur Traianon, it seems unlikely that Mr Andrews would fail to remember performing the work after the serious incident in which one of the chassis rails in Mr Davies' prime mover was replaced and the right forward drive axle mended.

57. Therefore, Mr Andrews probably performed the remediation after the less serious off-road incident in 1989/90 or on some other prime mover.

58. Further, if the off road incident was the second of the two incidents that occurred in 1989/90, Mr Andrews would probably have also remembered that the prime mover he remediated had recently undergone extensive repairs involving replacement of a chassis rail.

59. Therefore, by deduction, the off road incident probably occurred first and was remediated by Mr Andrews before the more serious incident occurred.

60. This means that the more serious incident in which one of the chassis rail in Mr Davies' prime mover was replaced and the right forward drive axle was mended was probably the second incident that occurred and was remediated in Queensland in 1989/90.

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[7] Transcript 14 December 2009, p. 5; transcript 14 October 2010, p. 38.

[8] Royans in Melbourne had no records to indicate their involvement in repairing the prime mover in 1989/90. Royans in Brisbane did not respond to the Court's request for more information about its involvement in repairing the prime mover in 1989/90.

61. Investigations undertaken by Dr Price for Meritor as part of this coronial investigation of Mr Dunn's death showed that damage to the right forward drive axle of Mr Davies' prime mover was repaired with two modifications to the axle:

- a weld between the spindle beyond the wheel seal and just outside the brake flange and the axle housing, and
- an additional plate welded on to the axle housing.

62. After these repairs had been performed, the evidence indicates that Mr Davies' prime mover operated normally for about 20 years:

- In 2002, Mr Nash was not aware of any specific problems for Mr Davies' prime mover when he was working full time for Traianon:

  "No, nothing that was recurring. It was just your average run-of-the-mill repair and maintenance."

- Mr Harbridge confirmed Mr Nash's experience over the entire life of Mr Davies' prime mover. He said:

  "It was actually a good truck. It did its day to day work and when maintenance was due, maintenance was due."

63. Further, Mr Davies' prime mover's maintenance records do not indicate any relevant history in the two years before Mr Dunn died.

64. Iveco service records show that they serviced the prime mover on three occasions for unrelated repairs in the two years before the incident in which Mr Dunn died:

- On 14 December 2005, Iveco were called out to a general breakdown. The odometer reading was 717314km. The battery power was low at times. Iveco found the wiring connections were loose at the starter motor because the wiring was poorly positioned and not holding tension on all terminals. Iveco repositioned and retensioned all starter motor wiring. This service cost $174.74 so I presume Iveco did not perform further work.

- On 16 December 2005, Iveco were called out to a general breakdown. The odometer reading was 717304km. The batteries were flat. They jump started the semi-trailer and travelled back to the work shop. This service cost $123.73 so I presume Iveco did not perform further work.

- On 22 December 2005, Iveco were called out to a general breakdown. The odometer reading was 717809km. They jump started the semi-trailer and travelled back to the work shop. This service cost $90 so I presume Iveco did not perform further work.

65. There is no record that Iveco serviced the truck after 22 December 2005.

66. Cummins South Pacific Pty Ltd service records show that they serviced Mr Davies' prime mover once in the year before the incident in which Mr Dunn died:

- On 22 July 2007, Peter Traianon asked Cummins to tune up the engine of the prime mover. The odometer reading was 717392km.

  On 24 July, they checked the engine for oil and coolant leaks, pressure test charged the air cooler and checked the valve and injector adjustment, fan belts, air filter, fuel system, turbo clearances and engine brakes. They checked the engine for low power. They found no faults, washed and returned the vehicle to service.

  On 26 July, as part of this same service, Cummins brought the prime mover into the workshop. They removed and cleaned up the drive pulley and belts, drive nuts and seal and cleaned up all surfaces. They then serviced the engine. They did not service the wheels or the axles.

67. Further, Mr Davies told the Court that he rang Peter Traianon about once every two weeks to say there was something wrong with the truck:

"Usually there was an electrical problem, the truck wouldn't start,..."

68. However, the maintenance records for Mrs Davies' prime mover do not mirror this frequency of Mr Davies' complaints.

69. Traianon maintenance records show that Peter Traianon and Anthony Traianon serviced Mr Davies' prime mover 13 times in the two years before Mr Dunn died:

- On 5 October 2005, they performed a full service.[9]
- On 12 December 2005, they greased the truck and adjusted the brakes. [10]
- On 23 December 2005, the odometer reading was 719076km. They changed the differential filter and the oils.
- On 4 January 2006, the odometer reading was 727803km. They changed the gear box oil.
- On 11 February 2006, the odometer reading was 729078km. They greased and adjusted the brakes and checked the differential and gear box oils.
- On 20 April 2006, the odometer reading was 735521km. They serviced the truck, changed all filters on the air brakes, greased the truck and changed the air element.
- On 13 August 2006, the odometer reading was 751335km. They greased the truck, adjusted the brakes and tightened the passenger seat.
- On 4 September 2006, the odometer reading was 755800km. They greased the truck with a full service and Wizard fitted a new windscreen.
- On 5 November 2006, the odometer reading was 767362km. They greased the truck and adjusted the brakes.
- On 24 January 2007, the odometer reading was 777056km. They performed a full service including changing the air and grease filters, changing the gear box and differential oil.
- On 9 June 2007, the odometer reading was 795623km. They greased the semi-trailer and adjusted the brakes. They also fitted four new rear axle drive tyres, fitted two new steer tyres, topped up the engine and forward differential oils, checked the brake lining of all four drive wheels and reupholstered the seats. Mr Nash told the Court he was also asked to look at the prime mover because it had a lean oil leak.

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[9] The odometer reading was obscured in the copy provided to the Court.

[10] The odometer reading was obscured in the copy provided to the Court.

- On 4 August 2007, the odometer reading was 797606km. They greased the truck and adjusted the brakes.

- On 15 August 2007, the odometer reading was 798520km. They performed a full service and changed all filters.

70. Using these data, on average Mr Davies' prime mover was serviced at least every 7070 km with a range of about 900km to 18500km between services.

71. The odometer reading on 1 October 2007 was 805657 kilometres. Therefore, Mr Davies' prime mover had travelled 7137 km since its last full service. It was due for a service at 818520 kilometres.

72. However, the Iveco Service Manual[11] indicates that the brake chamber of the front drive brakes of the prime-mover should be disassembled and cleaned every year or 80,000km. There is no indication in the service records that the brake chamber on the front drive brakes of the prime mover was disassembled in the two years prior to 2007.

73. Further, under the heading "Safety Checks and Precautions", the International Harvester Operators Manual indicates that:

> *"There is, however, an area in which the vehicle owner plays an important part and determines to a large measure the extent of continued safe, trouble-free service. Only the owner can ensure that the vehicle receives proper care through following the periodic lubricating procedures and arranging the regular inspections.*
>
> *We recommend that you arrange for your IH Dealer or Service Center to make an inspection at least once a year.*
>
> *Lubrication service presents a good opportunity to inspect the vehicle.....*
>
> *MAINTENANCE WARNING*
>
> *WARNING*

[11] Iveco Service Manual for International Trucks S & T Series Basic Manual, CTSA-2800.

For any maintenance other than normal running maintenance, International Harvester Australia Limited (the Company), recommends that the owner/operator seek qualified assistance from the Company or one of its authorised dealers or distributors or other person or company approved in writing by the Company.

In particular, the owner/operator should not interfere with the vehicle's steering and braking systems, suspension or chassis.

If the owner/operator acts otherwise than in accordance with this recommendation, the Company will not accept any responsibility for any loss or damage of any nature whatsoever."

74. However, there is no evidence before me that Iveco or Cummins South Pacific Pty Ltd or any other person approved by the manufacturer undertook regular inspections of the vehicle's steering and braking systems, suspension or chassis, at least in the two years before Mr Dunn died.

The oil leaks from the right forward drive wheel of Mr Davies' prime mover

75. The Court heard that Pater Traianon, Anthony Trainanon, Mr Harbridge, Mr Nash and Mr Davies were all aware of oil leaks from the right forward drive wheel on Mr Davies' prime mover in 2007.

76. Mr Harbridge said that failure of a hub seal is the most common cause of an oil leak from the wheel of a prime mover. He had seen about five fatigue cracks in prime mover axles but he had never seen one in a Rockwell axle before.

77. Peter Trainanon told the Court that he worked on oil leaks from the right forward drive wheel on Mr Davies' prime mover on three occasions in 2007:

- Peter Traianon first became aware of an oil leak from a hub seal on the right forward drive wheel on Mr Davies' prime mover in early August 2007. On this occasion, he pulled the wheel off and replaced the seal.

- A few days later, the oil began to leak again from the right forward drive wheel on Mr Davies' prime mover. Again, Peter Traianon pulled the wheel off and replaced the hub seal.

- A few days after this, the oil began to leak from the right forward drive wheel on Mr Davies' prime mover for a third time. Peter Traianon thought he may have installed the seal incorrectly. In his statement, Peter Traianon said he spoke to Mr Nash and Mr Harbridge about four weeks before 1 October 2007, that is in late August 2007.

78. Mr Davies told the Court that he reported one of these three oil leaks from the right forward drive wheel on his prime mover to Peter Traianon. Mr Davies said also he was not aware of an oil leak in the right forward drive wheel on his prime mover until late August 2007. He told the Court:

> *"before the truck was parked up before the accident, I reported two weeks prior that there was an oil leak on that wheel."*

79. However, Mr Davies also told the Court that he rang Peter Traianon about another oil leak from the right forward drive wheel on the prime mover two weeks before Mr Dunn died, that is in mid September 2007:

> *"....a previous one was smoke coming from a wheel* (on the same axle*), and I pulled over and rang Peter straight away and informed him."*

- This seems to have been a more serious oil leak than the two previously reported leaks.

- Further, Mr Davies told the Court that Peter Traianon told him to keep using the truck for the rest of the day:

  "Then Pete told me to use the trailer brakes to slow me down to stop, and when I finished the day come back to the yard, disconnect the trailer and park the prime mover in front of the workshop, and they will have a look at it."

- Mr Davies told the Court he knew there was an oil leak from right forward drive wheel on his prime mover:

  "Yes, because at the time when the smoke was coming out of the wheel, when I pulled over I got out of the truck and had a look, and there was oil, visible oil."

- Mr Davies also explained that he drove the truck to Dandenong and back using the trailer brakes.

- Then, Mr Davies says he parked his prime mover as directed by Peter Traianon:

  "I parked it in front of the workshop, and it sat there for two weeks, then Monday morning I came in and I noticed it was parked - it was hooked up to a trailer. I rang Pete to find out what I'll be doing that morning, and he notified me that the - I'd have to take that truck, and it was OK to go.... And if I had a problem with it, they will look at it that night."

80. However, analysis of Mr Davies' driving record indicates that he drove the semi-trailer almost full time throughout September 2007:

- On 3 September 2007, Mr Davies worked 12.25 hours. He drove the semi-trailer 342 km from 6:15am to 5:55pm.

- On 4 September 2007, Mr Davies worked 10 hours. He drove the semi-trailer 123 km from 8:45am to 5:00pm.

- On 5 September 2007, Mr Davies worked 14.5 hours. He drove the semi-trailer 440km from 5:45am to 8:30pm.

- On 6 September 2007, Mr Davies worked 9.5 hours. He drove the semi-trailer 98 km from 8:15am to 4:45pm.

- On 7 September 2007, Mr Davies worked 12.5 hours. He drove the semi-trailer 377 km from 5:00am to 4:15pm.

- On 10 September 2007, Mr Davies worked 10 hours. He drove the semi-trailer 201 km from 7:05am to 2:15pm.

- On 11 September 2007, Mr Davies worked 12 hours. He drove the semi-trailer 226 km from 8:10am to 6:50pm.

- On 12 September 2007, Mr Davies worked 14.5 hours. He drove the semi-trailer 343 km from 6:15am to 7:45pm.

- On 13 September 2007, Mr Davies worked 11.75 hours. He drove the semi-trailer 1976km from 5:35am to 3:40pm.

- On 14 September 2007, Mr Davies worked 10 hours. He drove the semi-trailer 193km from 4:40am to 12:50pm.

- On 17 September 2007, Mr Davies worked 9 hours. He drove the semi-trailer 307km from 8:00am to 12:15pm.

- On 18 September 2007, Mr Davies worked 3.75 hours. He drove the semi-trailer 121km from 11:05am to 1:30pm.

- On 19 September 2007, Mr Davies worked 14.5 hours. He drove the semi-trailer 406 km from 5:55am to 6:45pm.

- On 20 September 2007, Mr Davies worked 13.5 hours. He drove the semi-trailer 367 km from 7:20am to 2:00pm and from 3:05pm to 7:35 pm.

- On 21 September 2007, Mr Davies worked 9.25 hours. He drove the semi-trailer 207 km from 4:35am to 12:35pm.

- On 24 September 2007, Mr Davies worked 8 hours. He drove the semi-trailer 276 km from 8:00am to 1:50pm.

- On 25 September 2007, Mr Davies worked 10 1/2 hours. He drove the semi-trailer 99 km from 6:45am to 8:00am.

- On 26 September 2007, Mr Davies worked 6 1/2 hours. He drove the semi-trailer 118 km from 6:15am to 11:45am.

- On 27 September 2007, Mr Davies worked 14 1/2 hours. He drove the semi-trailer 464km from 6:30am to 7:25pm except for two hours in the workshop from 4:45pm to 6:25pm. This is last time he drove the semi-trailer before 1 October 2007.

81. The only report of damage or delays included in Mr Davies' daily work sheets for September 2007 was on 3 September when the left hand mud flap broke off.

82. Therefore, Mr Davies' daily work sheets and reported problems with the semi-trailer are inconsistent with his evidence about his use of the semi-trailer after he reported the third more serious oil leak from the right forward drive wheel to Peter Traianon during September 2007.

83. Therefore, I do not accept Mr Davies' memory about the date he reported what seems to be a separate serious oil leak from the right forward drive wheel on his prime mover in mid September 2007.

84. However, Mr Davies' daily work sheets from 6 to 31 August 2007 show that the semi-trailer only worked six days in that period:

- On 6 August 2007, Mr Davies worked 8 hours. He drove the semi-trailer 138 km from 8:45am to 3:30pm.
- On 7 August 2007, Mr Davies worked 11.5 hours. He drove the semi-trailer 350 km from 8:40am to 7:15pm.
- On 8 August 2007, Mr Davies worked 7.5 hours. He drove the semi-trailer 141 km from 8:45am to 3:05pm.
- On 9 August 2007, Mr Davies worked 11 hours. He drove the semi-trailer 157 km from 5:50am to 12:05pm.
- On 10 August 2007, Mr Davies worked 4 hours. He drove the semi-trailer 121 km from 9:20am to 12:00pm.
- On 21 August 2007, Mr Davies worked 13.5 hours. He drove the semi-trailer 374 km from 6:35am to 7:25pm.

85. There are no reports of damage or delays in Mr Davies' daily work sheets for August. However, he did not drive his semi-trailer for about two weeks between 10 and 21 August and then another two weeks between 21 August and 3 September 2007.

86. On 10 August 2007, Mr Davies' work sheets indicate that he drove to Broadmeadows. This is inconsistent with his report of driving to Dandenong on the day he reported the third serious oil leak from the right forward drive wheel of his prime mover to Peter Traianon.

87. On 21 August 2007, Mr Davies' work sheets indicate that he drove to Altona, Tullamarine, Laverton, Geelong, Springvale and back to Bacchus Marsh. It seems more likely that he has written Dandenong to mean Springvale because they are geographically close to each other and that this is the day that there was a previous serious oil leak from the right forward drive wheel on his prime mover.

88. Therefore, I accept Mr Davies' evidence to the extent that there was a previous serious oil leak from the right forward drive wheel on his prime mover.

89. Further, I find that this previous serious oil leak from the right forward drive wheel on the prime mover probably occurred on 21 August 2007.

90. In the absence of evidence from Peter Traianon, I make no finding as to the accuracy of Mr Davies' evidence that he told Peter Traianon about the serious oil leak from the right forward drive wheel on his prime mover that probably occurred on 21 August 2007.

91. Mr Nash knew about one of the oil leaks.

- Mr Nash told the Court that Peter Traianon asked him to look at Mr Davies' prime mover. He was unsure of the date but remembered it was on or about 27 August 2007. Mr Traianon told Mr Nash the truck had a hub seal leak on the right forward drive axle.

- Mr Nash also said that he removed the bearing and the hub seal on the right forward drive axle. He observed that the seal had not been installed correctly. The seal had been pinched and it had been damaged either prior to or during installation.

- Mr Nash also said that he inspected the wheel bearings and they were alright.

- Mr Nash agreed that there was a lot of oil in the vicinity of Mr Davies' prime mover consistent with failure of the hub seal and he did not check the axle housing because the seal was damaged and this explained the oil.

- Mr Nash then installed a new hub seal and the wheel and hub assembly, adjusted the wheel bearing and put the axle back in.

- Mr Nash was not told of any subsequent oil leaks from the right forward drive wheel on Mr Davies' prime mover.

92. Mr Harbridge also told the Court that he was aware of one oil leak from the right forward drive wheel on Mr Davies' prime mover prior to late September 2007.

- Mr Harbridge told the Court that Peter Traianon first contacted him about a month before Mr Dunn died, so in late August 2007.

- Mr Harbridge was sick at that time so he gave Peter Traianon instructions about how to slide the hub off and wash the parts up.

- When he went to do the work on the following Monday, Lindsey Nash was also in the yard. Mr Nash had already replaced the hub seal on the right forward drive wheel on Mr Davies' prime mover.

- Mr Harbridge told the Court that he did not remove the backing plate.

- Mr Harbridge explained that it is unlikely that a service man replacing a leaking hub seal would see any damage that also occurred in a position behind the backing plates for the brakes on the axle:

  "Well, if you take the backing plates and everything off you can see. But to do a hub seal you never really strip backing plates or anything like that off. You clean all the mess up, fit a new seal."

93. The repair log book provided to the Court did not include any specific reference to replacement of the hub seals on the right forward drive wheel on Mr Davies' prime mover. Mr Davies told the Court that he was surprised that this was the case.

94. However, Mr Nash was not surprised. He advised the Court that records from 9 June 2007 indicating there had been a *"Brake reline on all four drive wheels, fit four new drive tyres..."* implied that the hub seals had been replaced as part of the work.

95. Therefore, in the absence of any other similar recorded work on the drive wheels, I rely on the repair log book to confirm that one of the three events nominated by Peter Traianon was rectified on 9 June 2007.

96. I also rely on the corroborating evidence of Mr Davies, Mr Harbridge and Mr Nash to find that another of the three events nominated by Peter Traianon was reported and rectified on or about 21 August 2007.

97. The time line nominated by Peter Traianon for the third report of an oil leak from the right forward drive wheel of Mr Davies' prime mover places it within the period between 9 June and 21 August 2007.

98. Further, the two week period in which the prime mover was not used commencing 10 August 2007 is consistent with Mr Davies' evidence that there was a two week period when the truck was not used after he reported an oil leak and, accordingly, is likely to be the date of the second oil leak.

99. In his statement, Peter Traianon said that Mr Davies' prime mover continued to be used while it had an oil leak in the right forward drive wheel but it was not used as often because of it.. He told the Court:

> *"Other trucks would be used if there was one around."*

100. Therefore, there were at least three oil leaks from the right forward drive wheel on Mr Davies' prime mover in 2007. These probably occurred on or about 9 June, 10 August and 21 August 2007.

101. Peter Traianon explained all of these three leaks as hub seal failures and remedied them by replacing the seals. He did not regard them as creating an unsafe environment for Mr Davies or the public.

102. After Mr Dunn died, Senior Sergeant Robert Le Guier from the Victoria Police Major Collision Investigation Unit inspected the semi-trailer including Mr Davies' prime mover. He confirmed that the odometer on the prime mover indicated that it had travelled 805657km and that the inner hub seal on the right forward drive wheel was a recent replacement.

103. From this evidence, I infer that Peter Traianon or Anthony Traianon had also replaced the hub seal over the weekend of 27 to 30 September 2007. This was the fourth oil leak from the right forward drive wheel on Mr Davies' prime mover since 9 June 2007.

104. I have no evidence about the state of the hub seal that was removed over the weekend of 27-30 September 2007. However, in his statement made on 4 October 2007, Mr Harbridge said that he spoke to Anthony Traianon in the yard "*sometime on Sunday afternoon*", that is on 30 September 2007.

105. In this conversation, Anthony Traianon told Mr Harbridge that the same prime mover had another oil leak and that Mr Davies had told him that he could smell differential oil and see a leak around the plastic mudguard and drive wheels.

106. This evidence is inconsistent with Mr Davies' evidence in Court that he did not notice anything wrong with the semi-trailer on the previous day he drove it, which was 27 September 2007. However, I accept Mr Harbridge's statement made on 4 October 2007 rather than Mr Davies' memory in Court.

107. Anthony Traianon also told Mr Harbridge that Mr Davies' semi-trailer would be back in late on Monday afternoon (1 October 2007) and Mr Harbridge arranged to strip the hub off it then. He did not look at the truck at the time.

108. Therefore, I infer that Anthony Traianon remained concerned about this fourth oil leak from the right forward drive wheel on Mr Davies' prime mover even though he or Peter Traianon had replaced the hub seal over the weekend.

109. Mr Harbridge told the Court that he would have checked for fatigue in the axle housing, transmission housings and other mechanical housings if he had found nothing wrong with the hub seal.

110. Having inspected the broken axle after the event, Mr Harbridge also told the court that the fatigue crack would close when it had no weight on it. Therefore, it would be difficult to detect during routine maintenance:

> *"If the truck wasn't loaded it'd be very difficult to find a fatigue crack like that because like when you do a hub seal you've got to jack the truck up to take the weight off to do the hub."*

111. However, when he made this statement, Mr Harbridge was only aware of one of the three previous oil leaks from the forward right drive wheel on Mr Davies' prime mover. If he had known about the previous circumstances, Mr Harbridge told the Court:

> *"Yeah, that would've concerned me a bit more. You would've thought, well, you know, like it's getting closer and closer....But if it's done a month's work you think to yourself, well, that can be seal fatigue or anything because it's the nature of the beast. It's what trucks do."*

112. Mr Harbridge also told the Court that he would not be thinking about a fatigue crack early in his investigation of an oil leak from a wheel. Therefore, of itself he did not consider that an

oil leak was an indicator of an unsafe vehicle. This was also so when a repeat oil leak occurred over a month after the first oil leak.

113. Mr Harbridge also said he would not consider keeping the truck in until someone had had a look at it:

"I wouldn't really say that you would think that it would be that unsafe."

Fracture of the right forward drive axle of Mr Davies' prime mover on 1 October 2007

114. On 1 October 2007, Mr Davies started work at 7am. He spent an hour greasing another truck and inspecting the semi-trailer to make sure the lights were working, the tyres were pumped up, the trailer was connected properly, the plugs were in, there was sufficient water, oil and fuel, and there were no oil leaks before he started driving. He told the Court:

"There was no oil on that wheel."

115. At 10.00am, Mr Davies left the Traianon yard to pick up two loads of peanuts from Tullamarine and deliver them to Campbellfield. Each load was probably about 21 tonnes.

116. Then, at about 12:15pm, Mr Davis returned to Tullamarine to pick up 21 pallets of jeans to go to Braybrook. This load would have weighed about 12 tonnes.

117. Mr Davies stopped to pick up lunch in Boundary Road before he proceeded on to the Westgate Freeway heading towards the Westgate Bridge. He did not check the semi-trailer at all when he stopped for lunch. He did not notice any smell coming from the right forward drive axle of his prime mover.

118. At about 1:15pm on 1 October 2007, Mr Davies told the Court that he was driving his semi-trailer at about 100kph towards the City on the Westgate Freeway. He said there was nothing about the operation of the truck at this stage to indicate that there was anything wrong with it.

119. As Mr Davies' semi-trailer was travelling towards the Melbourne Road exit ramp in the second lane from the median on the five-lane Millers Road overpass on the Westgate Freeway, he felt his prime mover dip a bit to the right and there was no power. The truck was slowing down.

120. As Mr Davies was manoeuvring his semi-trailer into the outside lane, he checked his mirrors and saw a set of wheels travelling down the driver's side of his semi-trailer beside him.

121. Mr Davies noted that the set of wheels travelled parallel to the truck for about 500 metres before it hit the centre concrete barrier, rolled left in front of the still mobile semi-trailer across four city-bound lanes of vehicles, collided with an upright traffic sign and became airborne. The set of wheels then jumped a single lane of vehicles on the exit ramp and the guard rails and disappeared out of sight into trees.

122. Mr Davies got out of his semi-trailer and rang Peter Traianon on the mobile telephone to tell him there was a mechanical problem. At the same time, he and another person walked in the direction that the set of wheels had travelled.

123. Mr Davies and the other witness found Mr Dunn unresponsive on the ground. Mr Davies immediately told Peter Traianon while another witness examined Mr Dunn. He rang 000 when it became obvious to him that Mr Dunn was seriously injured.

124. After Mr Dunn died, the fracture on the right forward drive axle on his prime mover was investigated by four experienced investigators:

- Senior Sergeant Robert Le Guier;
- Barry Gartner;
- Chris Vines; and
- Dr John Price.

125. All the investigators agreed that the bottom part of the spindle on the right forward drive axle had fractured away from within the brake drum of Mr Davies' prime mover just beyond the inner brake shoes.

126. After reading Dr Price's analysis, all the investigators accepted that the incident in 1989/90, where one of the chassis rails on Mr Davies' prime mover required replacement, would probably have been associated with severe damage to the axle sufficient to explain its remediation using a weld between the spindle and the axle housing and an additional plate welded on to the axle housing.

127. The investigators also all agreed that it was likely that the damage sustained in 1989/90 was a factor in determining severance of the axle in 2007. However, they did not entirely agree with each other about how the cracks had originated and developed in the 20 years after the initial incident in which the axle on Mr Davies' prime mover was seriously damaged.

128. **Senior Sergeant Robert Le Guier** is a qualified mechanical investigator from the Victoria Police Major Collision Investigation Unit with 37 years practical experience in the automotive field.

129. Mr Le Guier inspected the dual wheel, hub, axle and part of the fractured axle housing from the right forward drive axle which had broken away from Mr Davies' prime mover.

130. Mr Le Guier found a large amount of differential oil on the inside of the inner wheel rim, brake shoe friction material, backing plate, leaf spring and brake servo unit. He attributed this oil to a fatigue-related fracture between the backing plate and inner wheel bearing. It appeared the oil had been leaking for some time.

131. Accordingly, Mr Le Guier originally said he was of the opinion that the axle housing was fractured and had been for some time.

132. However, after reading Dr Price's report, Mr Le Guier deferred to his analysis of the failure of the axle assembly of Mr Davies' prime mover.

133. **Barry Gartner** is a metallurgical and investigating engineer.

134. An expert opinion prepared for Worksafe by Mr Gartner indicated that the off-side mid axle had fractured away from within the brake drum, just beyond the inner brake shoes. The brake drum was bolted to the inside of the dual wheels beyond the spider hub.

135. Mr Gartner was also of the opinion that an event such as that causing remediation using a weld between the spindle and the axle housing and an additional plate welded on to the axle housing could also have led to some sort of cracking on the other side of the brake flange: not easy to see, very fine, very shallow cracking. This micro cracking could have been sufficient to initiate the crack that evolved into the fracture of the right forward drive axle on Mr Davies' prime mover on 1 October 2007.

136. Mr Gartner also said that there are three initiation zones for the fatigue fracture. Two of these initiation sites were caused from forming marks in the surface that have resulted during the manufacture of the tapered transition section that was located between the differential housing and the machined outer bearing surface.

137. The third site slightly forward around the surface of the axle tube has initiated from a relatively plain surface with some light corrosion pitting at the edge of a heat affected zone that has resulted from the welding of the transition section to the differential housing during manufacture of the axle. The heat of the welding has altered the microstructure such that the steel in the area would be slightly lower strength than the formed wheel.

138. Mr Gartner also pointed out that the heat affected zone of the toe of the weld is only 0.7mm beyond the fracture initiation plane. This area is particularly vulnerable to fatigue due to softening of the steel by the heat of welding.

139. All these sites were 10 and 11 millimetres from the edge of the heat affected zone associated with a circumferential manufacturing weld. However, Mr Gartner was unable to say there was anything else associated with this manufacturing weld to initiate the fracture.

140. After reading Dr Price's report Mr Gartner also accepted the fourth possible scenario that an overload event such as occurred in the first year of this prime mover's life could have led to the initiation of the cracks that eventually constituted the fracture. In evidence, he said:

> *"You need to have a high enough stress cycling, that is multiple flexing, to initiate fatigue. It's not necessarily a single event. But as I've agreed that a single event, in particular the altering of the stress distribution from the repair on the inside of the hub, could be that event that created more stress in this area."*

141. Mr Gartner also agreed that the repair weld could have shifted stresses from that side of the brake flange to the other side of the brake flange and therefore exacerbated or contributed to an increase in the fracturing on that side.

142. The final fracture occurred when the fatigue cracks from each direction met up at the inside of the tube with the final fracture through less than the 10mm wall thickness.

143. Mr Gartner was of the opinion that weeping of oil from the fine fatigue cracking that preceded the catastrophic final fracture would probably have been present earlier, after the crack was

about 7.5mm through the 10mm rim. After that, it should have shown up on the inside of the lower brake shoe. Until that stage, the crack would not have been visible to the naked eye.

144. Although, the progressive cracking could have been detected by magnetic particle crack detection techniques, this would not normally be carried out when servicing brakes unless a warning of cracking in such a location had been issued for this design of prime mover.

145. **Chris Vines** is a senior metallurgist who was appointed as an independent expert to inspect the broken axle.

146. Mr Vines advised that the axle failed because of fatigue cracking originating in the lower section of the axle assembly. Further, he formed the view that the cracking had not originated in the designed point of maximum stress concentration. Therefore, some other factor led to the relatively low applied stress concentration in the region of the crack.

147. After reading Dr Price's report, Mr Vines noted that he had seen the welded patch on the assembly when he first inspected Mr Davies' prime mover. However, he did not consider it relevant because he accepted it to be part of the original manufactured structure. He agreed with Dr Price's conclusions in this regard.

148. Mr Vines also observed that the cracking was in a position which is not routinely inspected and this region would be heavily contaminated with road grime. Although the cracking may become more visible as it progressed over time, it would remain concealed unless under stress to open the crack up. Therefore, even for a trained operator, it would be difficult to see.

149. **Dr John Price** is a mechanical and materials engineer. Meritor obtained an expert opinion from Dr Price.

150. Dr Price identified a low quality weld between the spindle and the axle housing and an additional plate welded on to the axle housing that was not part of the original manufacturer's specifications.

151. The weld and additional plate on the axle housing were adjacent to the fracture point at the end of the axle that failed, but on the other side of the mounting flange for the brake assembly and hub.

152. These alterations to the original design had not been identified by the other investigators and were not visible on the part of the axle that broke off from the prime mover.

153. In normal operation, the spindle forms part of the axle housing. Therefore, the extra welding and additional plate identified by Dr Price would not be visible to someone who was replacing the hub seal.

154. However, Dr Price was of the opinion that the extra welding and additional plate may be visible to someone who removed the wheel and axle housing in order to maintain the brakes.

155. Dr Price excluded the possibility that any of the relevant cracks initiated at a corrosion pit. In his opinion, the corrosion he saw on the axle was not sufficiently deep to cause this phenomenon and the corrosion pits were not lined up with each other in a way that would facilitate cracking between them.

156. Further, Dr Price said the major crack in the axle housing of the right forward drive axle on Mr Davies' prime mover grew from the underside of the axle and advanced towards the rear seam weld.

157. However, the developing crack and the ultimate axle break did not derive directly from the modification involving extra welding and an additional plate on the axle housing.

158. In particular, there is no evidence that either the remedial weld or the consequential change in the metallurgy of the axle around the remedial weld initiated the crack because the crack did not start in that area.

159. Rather, the initial weakness probably arose in or about 1989/90 when the prime mover was involved in a roll over and the axle was damaged. This incident would have caused the cracks to initiate in or near the heat affected zone around a weld originally performed as part of the axle manufacture.

160. As Dr Price told the Court:

> *"I think you need a strong overload to start it off. After that, normal use can drive a crack. '*

161. Alternatively, Dr Price told the Court that, after the cracks had been initiated:

"... during normal loadings it may not grow, but it would grow on some - if it was used on rough roads or something of this nature. So it's perfectly possible to postulate a 19 year period."

162. After the cracks were initiated, the remedial plate would have distributed the forces imposed by overload or critical events on the axle differently from that expected by the design engineers. This re-distribution probably caused the continuing progressive crack in the axle housing.

163. Accordingly, photographs of the metal structure show periods of active extension of the cracks and periods of rest.

164. To support his proposition, Dr Price relied on stress modelling and analysis performed by Jack McKenzie who was the Chief Engineer with the Commercial Vehicle Systems Division of AlvinMeritor Inc.:

"...they looked at it and that analysis came up with the concept that it was plausible that it (the plate) *caused a load transfer to this side. It strengthened up the other side, therefore it essentially throws the stress a bit to the unrepaired side - the unreinforced side."*

165. Further, there would be no oil leak from the developing crack or other evidence of the damaged structure until the developing crack had passed through the wall of the rim of the axle housing so that the oil could escape.

166. This means that, even if the wheel set was removed to service the brakes when the assembly was cold, the growing fracture would be very difficult to detect on visual inspection of the axle housing in that area because of the oil and grime that accumulates and because there would not be any associated oil leak during the development phase.

167. The third phase of the crack development commenced when the crack in the tubular axle housing breached the 10.7mm wall so that oil could leak from the inside of the axle housing and the differential into the brake assembly and then to the wheel area of the prime mover.

168. Accordingly, an oil leak in the wheel area of the prime mover would be visible during maintenance and inspection after the crack entered this third phase of the crack development.

169. Dr Price explained to the Court that the rate of oil leaking from the axle housing would vary depending on circumstances of its operation.

170. For example, when the truck was operating and under load, this crack would open up:

> *"...in operation the crack is opened up by the loads indicated. Now, the load indicated is basically the load that compresses the spring. So whether the crack is opened depends on whether that load is being applied at the time of inspection to a certain extent."*

171. The amount of oil leaking into the wheel area would increase as the crack in the axle housing grew, the load increased and/or the axle and brake housings heated up during use.

172. Accordingly, when the crack was open, oil would leak freely from the axle housing during operation. When the semi-trailer was cold and not under load, the crack would be closed and less oil would leak.

173. None of the independent experts had experience in servicing heavy vehicles so they could not assist the Court in determining when the crack in the axle housing should or could have been detected and its safety implications recognised.

174. **David Mold** is a qualified diesel mechanic and was Customer Service Regional Product Service Manager-Southern region for Iveco Trucks Australia Ltd. He had been involved in the heavy vehicle industry since 1984.

175. Mr Mold had also been employed as workshop manager for Volvo for 12 months and was the owner/operator and general manager of a retail truck and trailer repair workshop for five years. Therefore, he has experience in the servicing of heavy vehicles.

176. Mr Mold based his opinion on statements and the report of Mr Gartner. Mr Mold also prepared a supplementary report after reading Dr Price's report.

177. In Mr Mold's opinion, the only indication of a crack in the axle housing would be an oil leak in the wheel area.

178. However, the most common cause of an oil leak is a seal failure. Therefore, a competent mechanic who sees oil leaking from around the wheels would disassemble the wheel, clean the oil, remove the seal and check it for faults, then replace the seal.