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Your Ref: A-190617230642-S
Our Ref : CI/TPD19021325/P

15th January 2020

Occupational Safety & Health Division
Ministry of Manpower
1500 Bendemeer Road #04-02
Singapore 339946

MECHANICAL INSPECTION REPORT OF MITSUBISHI FORKLIFT

1. I refer to your request on 17th September 2019 to conduct a physical inspection of a Mitsubishi Forklift (herein referred to as "**Mitsubishi Forklift**"), which was involved in a fatal site accident

2. The objective of the inspection is to determine if there was any possible mechanical failure to the Mitsubishi Forklift that may have contributed to the accident.

3. Following the request, I had carried out a physical inspection of the Mitsubishi Forklift on 17th October 2019 at the premises of Asia-Pacific Shipyard Pte Ltd, 1 Benoi Road Singapore 629875. I now set out below my observations and comments with respect to this inspection.

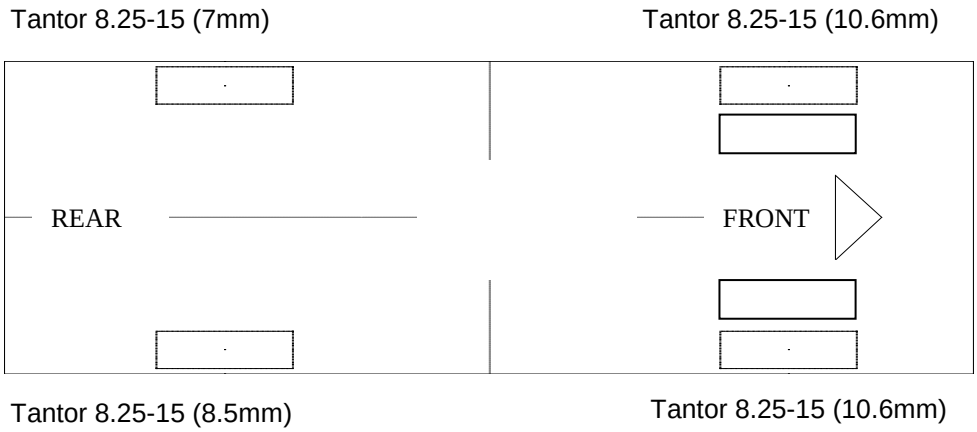
General Condition

4. The mileage of the Mitsubishi Forklift at the time of my inspection was recorded as 201,455km

5. The Mitsubishi Forklift was observed to be unaffected by the accident at the time of my inspection.

Tyres and Wheel Rims

6. The condition of the Mitsubishi Forklift's 6 tyres was observed to be in serviceable condition. I did not find any tear, cut or burst mark(s) on the outer and the inner sidewalls as well as across the tread of the 6 tyres. The 6 tyres were also observed to be sufficiently inflated for vehicular operation. The tyre brand, tyre size and remaining tread depth of the 6 tyres were recorded as follows:-



7. The 4 tyres were observed to be wrapped around standard steel wheel rims that were found to be without any damage. See photo 1 – 8 below.

Photo 1 shows a general view of the Mitsubishi Forklift's front at the time of my inspection. The front portion of the Mitsubishi Forklift was observed to have been unaffected by the accident.

Photo 2 shows a general view of the Mitsubishi Forklift's right body at the time of my inspection. The right portion of the Mitsubishi Forklift was observed to have been unaffected by the accident.

Photo 3 shows a general view of the Mitsubishi Forklift's left body at the time of my inspection. The left portion of the Mitsubishi Forklift was observed to have been unaffected by the accident.

Photo 4 shows a general view of the Mitsubishi Forklift's rear body at the time of my inspection. The rear portion of the Mitsubishi Forklift was observed to have been unaffected by the accident.

Photo 5 shows the condition of the front right tyre of the Mitsubishi Forklift, which was observed to be in serviceable condition with remaining tread depth of approximately 10.6mm. The tyre was sufficiently inflated for vehicular operation with no tear, cut or burst mark(s) on the outer and the inner sidewalls as well as across the tread. The 6 tyres of the Mitsubishi Forklift were wrapped around standard steel wheel rims without any damage.

Photo 6 shows the condition of the rear right tyre of the Mitsubishi Forklift, which was observed to be in serviceable condition with remaining tread depth of approximately 8.5mm. The tyre was also observed to be sufficiently inflated for vehicular operation with no tear, cut or burst mark(s).

Photo 7 shows the condition of the rear left tyre of the Mitsubishi Forklift, which was observed to be in serviceable condition with remaining tread depth of approximately 7mm. The tyre, which was wrapped around steel wheel rim, was also observed to be sufficiently inflated for vehicular operation. The 6 tyres of the Mitsubishi Forklift were wrapped around standard steel wheel rims.

Photo 8 shows the condition of the front left tyre of the Mitsubishi Forklift, which was observed to be in serviceable condition with remaining tread depth of approximately 10.6mm. There was also no tear, cut or burst mark(s) on the outer and the inner sidewalls as well as across the tread of the Mitsubishi Forklift's 6 tyres.

Engine Compartment & Operating Fluids

8. Upon examination of the engine compartment of the Mitsubishi Forklift, I had observed all the parts and components inside the engine compartment to be intact and unaffected by the accident. The engine coolant and ATF transmission fluid was found to be of sufficient level for operating purposes. Visually, there was also no contamination.

9. However, the engine oil and brake fluid was observed to be insufficient level at the time of our inspection.

10. Further examination of the engine compartment revealed no sign(s) or indication(s) of fluid leakage and/or fluid stain within the engine compartment of the Mitsubishi Forklift.

11. My subsequent checks on the underside of the Mitsubishi Forklift also revealed no sign(s) or indication(s) of fluid leak and/or fluid stain(s). Visually, the various undercarriage components of the Mitsubishi Forklift were all observed to be intact and without any visible damage. See photo 9 – 15 below.

Photo 9 shows a general view of the Mitsubishi Forklift's engine compartment. The various parts and components inside the engine compartment were unaffected by the accident. There was also no sign(s) or indication(s) of fluid leakage and/or fluid stain within the engine compartment.

Photo 10 shows the brake fluid reservoir of the Mitsubishi Forklift at the time of my inspection. The brake fluid was observed to be insufficient level (arrowed)

Photo 11 shows checks being carried out to the engine coolant of the Mitsubishi Forklift at the time of my inspection. The engine coolant was observed to be of sufficient level without any visible contamination.

Photo 12 shows the engine oil dip stick of the Mitsubishi Forklift at the time of my inspection. The engine oil was observed to be of insufficient level (arrowed)

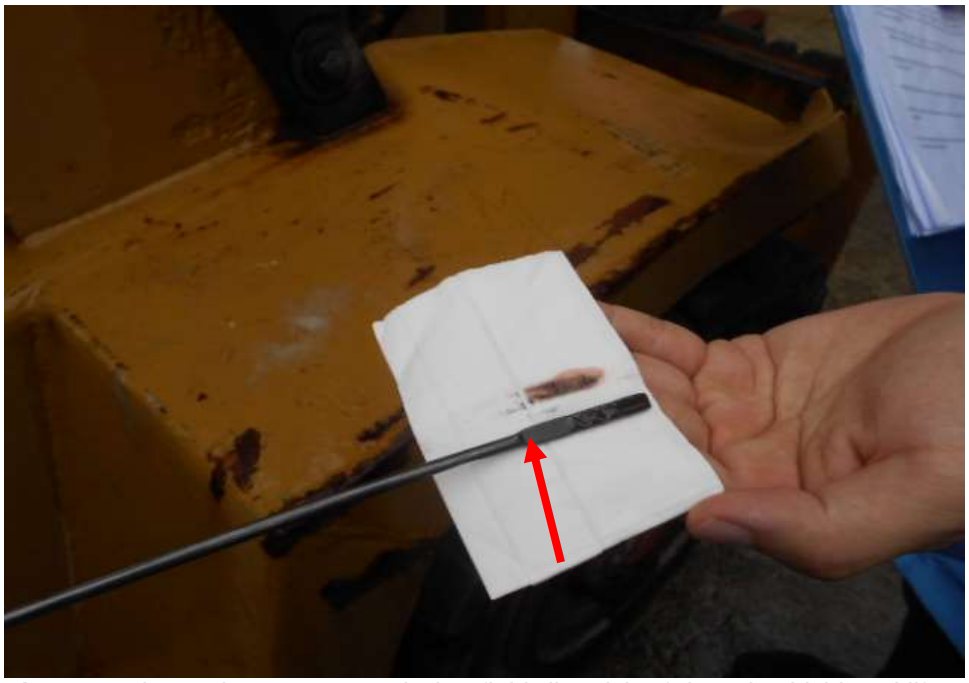


Photo 13 shows the ATF transmission fluid dip stick of the Mitsubishi Forklift at the time of my inspection. The ATF transmission fluid (pink colour) was observed to be of sufficient level and without any visible contamination (arrowed)

Photo 14 shows the differential gear oil (yellow colour) and the ATF transmission fluid (pink colour) used by the Mitsubishi Forklift and stored at the site warehouse at the time of my inspection.

Photo 15 shows the undercarriage of the Mitsubishi Forklift, at the area where the engine housing and transmission housing are located. I did not find any sign(s) or indication(s) of fluid leak and/or fluid stain(s) on the underside of the Mitsubishi Forklift.

Braking System & Steering System

12. Static brake tests conducted on the Mitsubishi Forklift revealed abnormality. The brake booster did not respond well to the various tests conducted. There was abnormal movement to the brake pedal when it was depressed as the brake pedal had sink down onto the floorboard. In general, the static brake tests had suggested that there was internal leakage of pressure/vacuum in the braking system of the Mitsubishi Forklift. The braking system of the Mitsubishi Forklift was in unserviceable condition.

13. The brake fluid was also of insufficient level. There was sign(s) of old and fresh brake fluid stains leaking out from the brake cylinder piston.

14. Static test on the steering system of the Mitsubishi Forklift also revealed no abnormality to the steering system. I did not experience any abnormal free play and/or other resistance when turning the steering wheel left and right to full lock positions. My visual examination of the various steering components which had included the steering rack and pinion, tie rods, tie rod ends and ball joints revealed that these components were all generally in good condition. See photo 16 - 23 below.

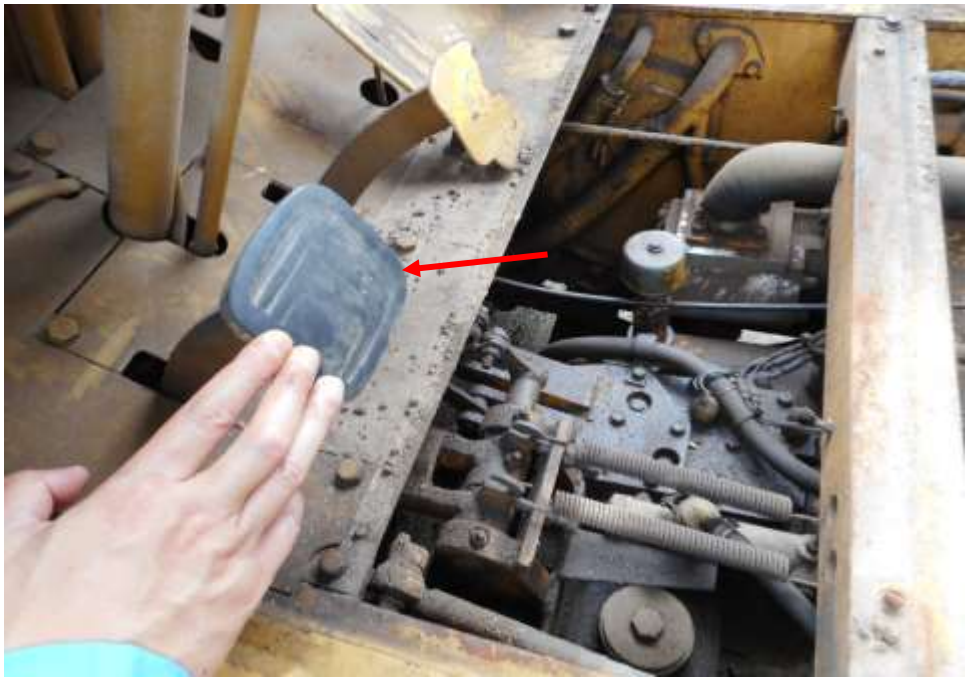


Photo 16 shows the static tests on the Mitsubishi Forklift braking system & brake pedals before depressing (arrowed)

Photo 17 shows the static tests on the Mitsubishi Forklift braking system & brake pedals after depressing (arrowed). There was abnormal movement to the brake pedals when it was depressed as the brake pedal had sink down onto the floorboard. In general, the static brake tests had suggested that there was internal leakage of pressure/vacuum in the braking system of the Mitsubishi Forklift. The braking system of the Mitsubishi Forklift was in unserviceable condition.

Photo 18 shows the brake hose/pipe (arrowed) at the front right wheel of the Mitsubishi Forklift. I did not observe any leakage of brake fluid at the time of my inspection of the Mitsubishi Forklift.

Photo 19 shows the brake hose/pipe (arrowed) at the front left wheel of the Mitsubishi Forklift. I did not observe any leakage of brake fluid at the time of my inspection of the Mitsubishi Forklift.

Photo 20 shows the brake cylinder piston (arrowed) there were sign(s) of old and fresh brake fluid stains leaking out from the brake cylinder piston.

Photo 21 shows the various undercarriage components at the front right wheel of the Mitsubishi Forklift, in particular the steering tie rod (red arrow) The various steering components were all found to be intact, suggesting that the steering system of the Mitsubishi Forklift was likely to be in serviceable condition at the material time of accident. There was also no sign of fluid stain observed on the various undercarriage components at the front right wheel of the Mitsubishi Forklift.

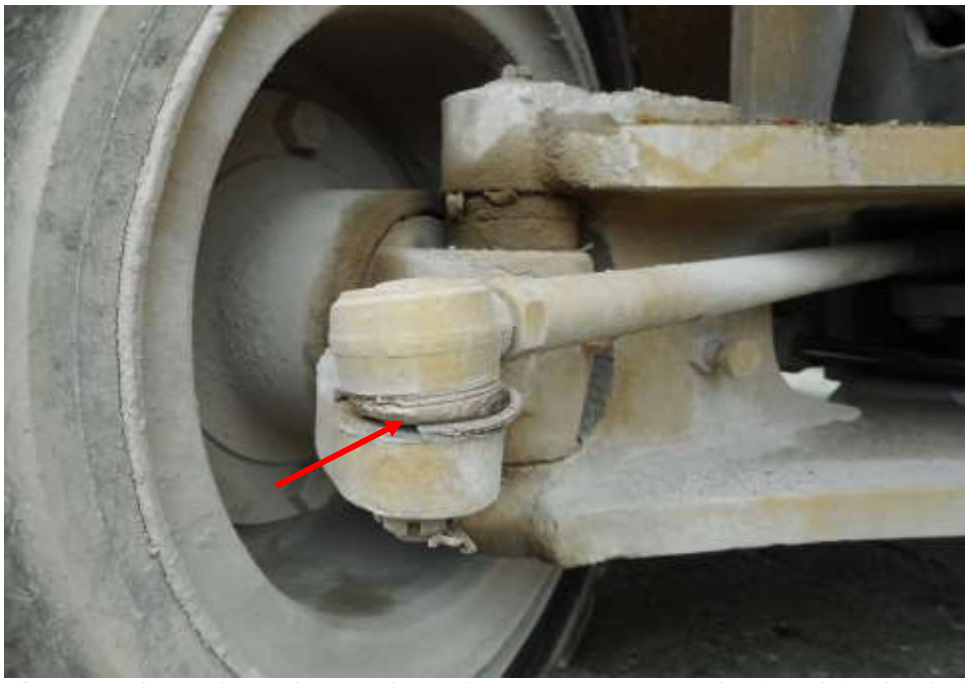


Photo 22 shows the various undercarriage components at the front left wheel of the Mitsubishi Forklift, in particular the steering tie rod (red arrow) The various steering components were all found to be intact, suggesting that the steering system of the Mitsubishi Forklift was likely to be in serviceable condition at the material time of accident. There was also no sign of fluid stain observed on the various undercarriage components at the front left wheel of the Mitsubishi Forklift.

Photo 23 shows the rear left wheel of the Mitsubishi Forklift turned to its full right. During my steering system test, I did not experience any abnormal free play and/or resistance when I had turned the steering wheel towards the left and right. This would suggest that the steering system of the Mitsubishi Forklift was likely to be in serviceable condition at the material time of accident.

Operational Behaviour of the Mitsubishi Forklift

15. A short operational test of the Mitsubishi Forklift, to primarily determine whether there was any abnormality to its engine system, its transmission system and braking system was subsequently carried out.

16. During the operational test, the transmission system of the Mitsubishi Forklift was able to be shifted to drive mode and reverse mode without any difficulty. There was no abnormal sounds heard and/or abnormal behaviour of the Mitsubishi Forklift's engine system. It was able to move forward and backward normally.

17. However the braking system was also found to be unserviceable condition as the Mitsubishi Forklift was unable to fully slow down and come to a complete stop by depressing the brake pedal. The use of emergency handbrake was required to slow down and come to a complete stop, due to the internal leakage of pressure/vacuum and insufficient brake fluid in the brake reservoir of the braking system. A video recording showing he operational test to the Mitsubishi Forklift is enclosed in this report.

18. We observed the rear view mirrors, front headlamp signal lights and rear signal and brake lights of the Mitsubishi Forklift to be intact and working condition. However, we did not observe a horn mounted on the Forklift. See photo 24-28 below.

Photo 24 shows the left rear view mirror of the Mitsubishi Forklift to be intact and serviceable condition at the time of inspection.

Photo 25 shows the right rear view mirror of the Mitsubishi Forklift to be intact and serviceable condition at the time of inspection.

Photo 26 shows the left signal and headlights of the Mitsubishi Forklift to be intact and serviceable condition at the time of inspection.

Photo 27 shows the right signal and headlights of the Mitsubishi Forklift to be intact and serviceable condition at the time of inspection.

Photo 28 shows the both left and right signal and brake lights of the Mitsubishi Forklift to be intact and serviceable condition at the time of inspection.

Conclusion of Mitsubishi Forklift

19. From my physical inspection of the Mitsubishi Forklift, it appears that its engine system, transmission system and steering system were all in serviceable condition. However I had found the Mitsubishi Forklift's braking system to be in an unserviceable condition at the time of inspection.

20. A short operational test of the Mitsubishi Forklift, which I had conducted, revealed that applying of the foot brake was not able to slow down and bring the Mitsubishi Forklift to a complete stop and thus the emergency handbrake had to be applied to slow and stop the Forklift. This was due to insufficient brake fluid in the braking system.

21. The 6 tyres of the Mitsubishi Forklift were found to be in serviceable condition. I did not find any tear, cut or burst mark(s) on the outer and the inner sidewalls as well as across the tread of the 6 tyres. The 6 tyres were also observed to be sufficiently inflated for vehicular operation with remaining tread depth of approximately 7mm to 10.6mm.

Sherwin Beh
Technical Investigator

Ang Bryan Tani
AMSOE, AMIRTE, AFF SAE, M.MATAI, AFF.Inst.AEA
Senior Technical Investigator
Technical Investigation & Reconstructionist (SAE-A)

Your Ref: A-190617230642-S
Our Ref : CI/TPD19021325/P-1

15th January 2020

Occupational Safety & Health Division
Ministry of Manpower
1500 Bendemeer Road #04-02
Singapore 339946

MECHANICAL INSPECTION REPORT OF KOMATSU FORKLIFT

1. I refer to your request on 17th September 2019 to conduct a physical inspection of a Komatsu Forklift (herein referred to as "**Komatsu Forklift**"), which was involved in a fatal site accident

2. The objective of the inspection is to determine if there was any possible mechanical failure to the Komatsu Forklift that may have contributed to the accident.

3. Following the request, I had carried out a physical inspection of the Komatsu Forklift on 17th October 2019 at the premises of Asia-Pacific Shipyard Pte Ltd, 1 Benoi Road Singapore 629875. I now set out below my observations and comments with respect to this inspection.

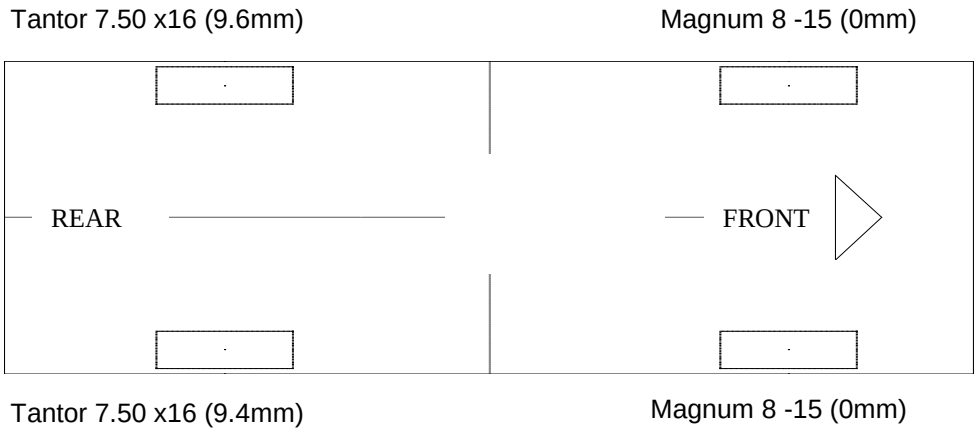
General Condition

4. The Hour usage of the Komatsu Forklift at the time of my inspection was recorded as 3,661 usage hours

5. The Komatsu Forklift was observed to sustained damage to its front & rear portion. Its left fork and rear frame were amongst the body parts that were damaged as a result of the accident.

Tyres and Wheel Rims

6. The condition for the Komatsu Forklift both front tyres was found to be in unserviceable condition. However the Komatsu Forklift's both 2 rear tyres was observed to be in serviceable condition. I did not find any tear, cut or burst mark(s) on the outer and the inner sidewalls as well as across the tread of the 4 tyres. The 4 tyres were also observed to be sufficiently inflated for vehicular operation. The tyre brand, tyre size and remaining tread depth of the 4 tyres were recorded as follows:-



7. The 4 tyres were observed to be wrapped around standard steel wheel rims that were found to be without any damage. See photo 1 – 10 below.

Photo 1 shows a front view of the Komatsu Forklift at the time of my inspection. The Komatsu Forklift was observed to have sustained damage at its front & rear portion. Its left fork and rear frame were amongst the body parts that were damaged as a result of the accident.

Photo 2 shows a close up view of the Komatsu Forklift's Fork at the time of my inspection. Its left fork was amongst the body parts that were damaged as a result of the accident.

Photo 3 shows a rear view of the Komatsu Forklift's at the time of my inspection. Its rear frame (circled) was amongst the body parts that were damaged as a result of the accident.

Photo 4 shows a rear view of the Komatsu Forklift's at the time of my inspection. Its rear frame (circled) was amongst the body parts that were damaged as a result of the accident.

Photo 5 shows a general view of the Komatsu Forklift's right body at the time of my inspection. The right portion of the Komatsu Forklift was observed to have been unaffected by the accident.

Photo 6 shows a general view of the Komatsu Forklift's left body at the time of my inspection. The left portion of the Komatsu Forklift was observed to have been unaffected by the accident.

Photo 7 shows the condition of the front right tyre of the Komatsu Forklift, which was observed to be in unserviceable condition with remaining tread depth of approximately 0mm. The tyre was sufficiently inflated for vehicular operation with no tear, cut or burst mark(s) on the outer and the inner sidewalls as well as across the tread. The 4 tyres of the Komatsu Forklift were wrapped around standard steel wheel rims without any damage.

Photo 8 shows the condition of the rear right tyre of the Komatsu Forklift, which was observed to be in serviceable condition with remaining tread depth of approximately 9.4mm. The tyre was also observed to be sufficiently inflated for vehicular operation with no tear, cut or burst mark(s).

Photo 9 shows the condition of the rear left tyre of the Komatsu Forklift, which was observed to be in serviceable condition with remaining tread depth of approximately 9.6mm. The tyre, which was wrapped around steel wheel rim, was also observed to be sufficiently inflated for vehicular operation. The 4 tyres of the Komatsu Forklift were wrapped around standard steel wheel rims.

Photo 10 shows the condition of the front left tyre of the Komatsu Forklift, which was observed to be in unserviceable condition with remaining tread depth of approximately 0mm. There was also no tear, cut or burst mark(s) on the outer and the inner sidewalls as well as across the tread of the Komatsu Forklift's 4 tyres.

Engine Compartment & Operating Fluids

8. Upon examination of the engine compartment of the Komatsu Forklift, I had observed all the parts and components inside the engine compartment to be intact and unaffected by the accident. The engine oil and engine coolant was found to be of sufficient level for operating purposes. Visually, there was also no contamination.

9. However, observed that the fluid used in the transmission gearbox of the Komatsu Forklift was Differential gear oil instead of ATF fluid at the time of our inspection.

10. Further examination of the engine compartment revealed no sign(s) or indication(s) of fluid leakage and/or fluid stain within the engine compartment of the Komatsu Forklift.

11. My subsequent checks on the underside of the Komatsu Forklift also revealed no sign(s) or indication(s) of fluid leak and/or fluid stain(s). Visually, the various undercarriage components of the Komatsu Forklift were all observed to be intact and without any visible damage. See photo 11 – 17 below.

Photo 11 shows a general view of the Komatsu Forklift's engine compartment. The various parts and components inside the engine compartment were unaffected by the accident. There was also no sign(s) or indication(s) of fluid leakage and/or fluid stain within the engine compartment.

Photo 12 shows checks being carried out to the brake fluid of the Komatsu Forklift at the time of my inspection. The brake fluid was observed to be of sufficient level and without any visible contamination.

Photo 13 shows checks being carried out to the engine coolant of the Komatsu Forklift at the time of my inspection. The engine coolant was observed to be of sufficient level and without any visible contamination.

Photo 14 shows the engine oil dip stick of the Komatsu Forklift at the time of my inspection. The engine oil was observed to be of sufficient level (arrowed)

Photo 15 shows the ATF transmission fluid dip stick of the Komatsu Forklift at the time of my inspection. The observed was differential gear oil (yellow colour) instead of the supposed ATF transmission fluid (pink colour) which was the wrong type of fluid used.

Photo 16 shows the differential gear oil (yellow colour) and the ATF transmission fluid (pink colour) used by the Komatsu Forklift and stored at the site warehouse at the time of my inspection.

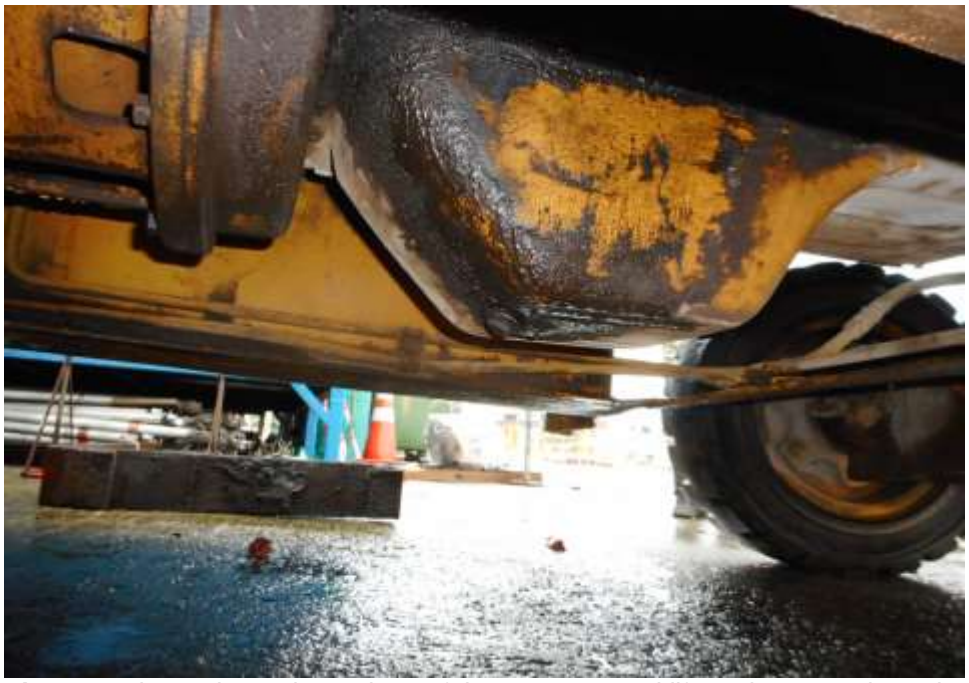


Photo 17 shows the undercarriage of the Komatsu Forklift, at the area where the engine housing and transmission housing are located. I observed old fluid stain(s) on the underside of the Komatsu Forklift.

Braking System & Steering System

12. Static brake tests conducted on the Komatsu Forklift revealed abnormality as a spongy pedal was felt upon depressing of the brake pedal. The brake booster did not respond well to the various tests conducted as there was abnormal movement of the brake pedal when it was depressed the brake pedal had a spongy feeling. However, the static brake tests had suggested that there was no internal leakage of pressure/vacuum in the braking system of the Komatsu Forklift and also that there was no sign(s) of brake fluid leakage along the brake hoses and brake pipes.

13. Static test on the steering system of the Komatsu Forklift also revealed no abnormality to the steering system. I did not experience any abnormal free play and/or other resistance when turning the steering wheel left and right to full lock positions. My visual examination of the various steering components which had included the steering cylinder and joints revealed that these components were all generally in good condition. See photo 18 - 25 below.

Photo 18 shows the brake hose/pipe (arrowed) at the front right wheel of the Komatsu Forklift. I did not observe any leakage of brake fluid at the time of my inspection of the Komatsu Forklift.

Photo 19 shows the brake hose/pipe (arrowed) at the front left wheel of the Komatsu Forklift. I did not observe any leakage of brake fluid at the time of my inspection of the Komatsu Forklift.

Photo 20 shows the various undercarriage components at the front right wheel of the Komatsu Forklift, in particular the steering cylinder and joints (red arrows). The various steering components were all found to be intact, suggesting that the steering system of the Komatsu Forklift was likely to be in serviceable condition at the material time of accident. There was also no sign of fluid stain observed on the various undercarriage components at the front right wheel of the Komatsu Forklift.

Photo 21 shows the various undercarriage components at the front left wheel of the Komatsu Forklift, in particular the steering cylinder and joints (red arrow). The various steering components were all found to be intact, suggesting that the steering system of the Komatsu Forklift was likely to be in serviceable condition at the material time of accident. There was also no sign of fluid stain observed on the various undercarriage components at the front left wheel of the Komatsu Forklift.

Photo 22 shows the rear left wheel of the Komatsu Forklift turned to its full right. During my steering system test, I did not experience any abnormal free play and/or resistance when I had turned the steering wheel towards the left and right. This would suggest that the steering system of the Komatsu Forklift was likely to be in serviceable condition at the material time of accident.

Operational Behaviour of the Komatsu Forklift

14. A short operational test of the Komatsu Forklift, to primarily determine whether there was any abnormality to its engine system, its transmission system and braking system was subsequently carried out.

15. During the operational test, the various transmission gears of the Komatsu Forklift were able to be engaged without any difficulty by stepping on the clutch pedal and manually shifting the gear lever. There were no abnormal sounds heard and/or abnormal behaviour of the Komatsu Forklift's engine system. It was able to move forward and backward normally.

16. The braking system upon operational testing, it revealed that it was inefficient as it required a longer stopping distance and higher pedal effort to bring the Komatsu Forklift to a complete stop; this was likely due to the wear and tear of the braking components and deterioration of brake fluid quality. A video recording showing the operational test to the Komatsu Forklift is enclosed in this report.

17. We observed that there was no left rear view mirror, both front headlights disconnected, no front signal lights present; both rear signal and rear brake lights not in working condition. However, the horn of the Komatsu Forklift was found to be intact and in working condition. See photo 23-26 below.

Photo 23 shows a disconnected left headlight. No left rear view mirror and front signal lights were installed on the Komatsu Forklift at the time of inspection.

Photo 24 shows a disconnected right headlight and no right signal light installed. However, a right rear view mirror was observed on the Komatsu Forklift at the time of inspection.

Photo 25 shows the horn (arrowed) of the Komatsu Forklift to be intact and serviceable condition at the time of inspection.

Photo 26 shows the both left and right signal and brake lights of the Komatsu Forklift were observed to be not working at the time of inspection.

Others

18. It was found that fluid in the automatic transmission of the Komatsu Forklift at the time of inspection was Differential gear oil instead of the ATF transmission fluid. Differential gear oil is thicker in viscosity and do not contain all the additives needed to smoothly lubricate and run the automatic transmission and thus result in an unsmooth operation of the Komatsu Forklift. Refer above to photo 15 and 16 of Komatsu Forklift.

Conclusion of Komatsu Forklift

19. From my physical inspection of the Komatsu Forklift, it appears that its engine system, transmission system and steering system were all in serviceable condition.

20. A short operational test of the Komatsu Forklift, which I had conducted, did not produce any sign(s) or symptom(s) to suggest that there was any abnormality to its engine system and its transmission system. However its braking system was found to be inefficient as it requires a longer distance and higher pedal effort to bring it to a complete stop.

21. The both front left and right 2 tyres were found to be unserviceable due to insufficient tyre tread depth at 0mm. However, the both rear left and right 2 tyres of the Komatsu Forklift were found to be in serviceable condition with remaining tread depth of 9.4mm to 9.6mm. I did not find any tear, cut or burst mark(s) on the outer and the inner sidewalls as well as across the tread of the 4 tyres.

Sherwin Beh
Technical Investigator

Ang Bryan Tani
AMSOE, AMIRTE, AFF SAE, M.MATAI, AFF.Inst.AEA
Senior Technical Investigator
Technical Investigation & Reconstructionist (SAE-A)