MEDIUM/HEAVY TRUCK BRAKES
Course Syllabus

Course Number: TRUK-0329  OHLAP Credit: No
OCAS Code: None
Course Length: 105 Hours
Career Cluster: Transportation, Distribution, and Logistics
Career Pathway: Medium/Heavy Diesel Truck Repair
Career Major(s): Diesel Service Technician

Pre-requisite(s): In this course students are taught the operation of air brake systems, brake hydraulic systems. Problem-solving techniques and repair procedures for these systems and related components are covered in this course.

Textbooks/Materials:
- PTTTS Truck Web-Bases Training Online Courses

Course Objectives:

A. Listen to and verify the operator’s concern, review past maintenance and repair documents, and determine necessary action. (Brakes – III)

B. Describe the Operation of an Air Brake System and Its Components.
   1. List the components of a single circuit air brake system.
   2. Discuss the operation of a dual air brake system.
   3. Define brake compatibility.
   4. Discuss the effects of the Federal Motor Vehicle Safety Standard (FMVSS) No. 121 on present day air brake systems.
   5. Identify major components of an air compressor.
   6. Describe the operation of desiccant and after cooler air dryers.
   7. List the various pneumatic valves and controls used in an air brake system.
   8. Explain the operation of an air brake chamber.
   9. Discuss the operation of cam and wedge actuated drum brakes.
  10. Compare the usage and operation of manual and automatic slack adjusters.
  11. List the components of an air disc brake system.
  12. Explain the operation of an antilock brake system.
  13. Comply with personal and environmental safety practices associated with clothing; eye protection; hand protection; proper lifting practices; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of fuels/chemicals/materials in accordance with federal, state, and local regulations. (Brakes – III)

C. Solve Problems Related to the Air Supply and Service Systems of a Diesel Powered Vehicle.
   1. Diagnose poor stopping, air leaks, premature wear, pulling, grabbing, or dragging problems caused by supply and service system malfunctions;
determine needed action. (P1-III.A.1.1)
2. Check air system build-up time; determine needed action. (P1-III.A.1.2)
3. Inspect, adjust, align compressor drive belts, pulleys, and tensioners; replace as needed. (P1-III.A.1.3)
4. Inspect compressor drive gear and coupling; replace as needed. (P3-III.A.1.5)
5. Inspect air compressor, air cleaner/supply; inspect oil supply and coolant lines, fittings, and mounting brackets; repair or replace as needed. (P2-III.A.1.6)
6. Inspect and test system pressure controls; governor, unloader assembly valves, intake screens, filters, lines, hoses, and fittings; replace as needed. (P1-III.A.1.7)
7. Inspect air system lines, hoses, fittings, and couplings; repair or replace as needed. (P1-III.A.1.8)
8. Inspect and test air tank relief (safety) valves, one-way (single) check valves, two-way (double) check valves, manual and automatic drain valves; replace as needed. (P1-III.A.1.9)
9. Inspect and test hand brake (trailer) control valve, lines, fittings, and mountings; repair or replace as needed. (P1-III.A.1.13)
10. Inspect and test brake relay valve; replace as needed. (P1-III.A.1.14)
11. Inspect and test emergency (spring) brake control/modulator valve(s); replace as needed. (P1-III.A.1.15)
12. Inspect and test low pressure warning devices, wiring, and connectors; replace as needed. (P1-III.A.1.17)
13. Inspect and test front and rear axle limiting (proportioning) valves; replace as needed. (P3-III.A.1.16)
14. Inspect and test tractor protection valve; replace as needed. (P1-III.A.1.12)
15. Inspect and test brake application (foot) valve, fittings and mounts; adjust or replace as needed. (P1-III.A.1.11)
16. Inspect and test stop light circuit switches, wiring, and connectors; repair or replace as needed. (P1-III.A.1.10)
17. Inspect and test brake application (foot) valve, fittings and mounts; adjust or replace as needed. (P1-III.A.1.11)
18. Inspect and test brake application (foot) valve, fittings and mounts; adjust or replace as needed. (P1-III.A.1.11)
19. Inspect and test brake application (foot) valve, fittings and mounts; adjust or replace as needed. (P1-III.A.1.11)
20. Inspect and test brake relay valve; replace as needed. (P1-III.A.1.14)
21. Inspect and test front and rear axle limiting (proportioning) valves; replace as needed. (P3-III.A.1.16)
22. Inspect and test tractor protection valve; replace as needed. (P1-III.A.1.12)
23. Inspect and test emergency (spring) brake control/modulator valve(s); replace as needed. (P1-III.A.1.15)
24. Inspect and test low pressure warning devices, wiring, and connectors; replace as needed. (P1-III.A.1.17)
25. Inspect and test air pressure gauges, lines, and fittings; replace as needed. (P2-III.A.1.20)
26. Test the air brake system for compliance with the regulations of FMVSS No. 121.

D. Diagnose and Repair Mechanical Air Brakes.
1. Listen to and verify operator’s complaint; review past maintenance documents, determine needed repairs. (III)
2. Diagnose poor stopping, brake noise, premature wear, pulling, grabbing, or dragging problems caused by the foundation brake, slack adjuster, and brake chamber problems; determine needed repairs. (P1-III.A.2.1)
3. Inspect and test service brake chambers, diaphragm, clamp, spring, pushrod, clevis, and mounting brackets; repair or replace as needed. (P1-III.A.2.2)
4. Inspect and service manual and automatic slack adjusters; perform needed action. (P1-III.A.2.3)
5. Inspect camshafts, rollers, bushings, seals, spacers, retainers, brake spiders, shields, anchor pins and springs; replace as needed. (P1-III.A.2.4)
6. Inspect, clean, and adjust air disc brake caliper assemblies; determine needed repairs. (P3-III.A.2.5)
7. Inspect and measure brake shoes, linings, or pads; perform needed action.
8. Inspect and measure brake drums and rotors; perform needed action. (P1-III.A.2.7)

E. Diagnose and Repair Parking Brakes.
1. Inspect and test parking (spring) brake chamber diaphragm and seals; replace parking (spring) brake chamber; dispose of removed chambers in accordance with local regulations. (P1-III.A.3.1)
2. Inspect and test parking (spring) brake check valves, lines, hoses, and fittings; replace as needed. (P1-III.A.3.2)
3. Inspect and test parking (spring) brake application and release valve; replace as needed. (P2-III.A.3.3)
4. Manually release (cage) and reset (uncage) parking (spring) brakes in accordance with manufacturer’s recommendations. (P1-III.A.3.4)

F. Inspect and Repair Brake Hydraulic Systems.
1. Inspect, test, and replace anti-lock brake system (ABS) air, hydraulic, electrical, and mechanical components; perform needed action. (P1-III.B.4.4)
2. Diagnose poor stopping and wheel lock-up caused by failure of the anti-lock brake system (ABS); determine needed action. (P1-III.B.4.3)
3. Observe antilock brake system (ABS) warning light operation (includes dash mounted trailer ABS warning light); determine needed action. (P1-III.B.4.1)
4. Interface with vehicle’s on-board computer; perform diagnostic procedure using recommended electronic diagnostic equipment and tools (to include PC based software, and/or data scan tools); determine needed repairs.
5. Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or specified test equipment (scan tool, PC computer); determine needed action. (P1-III.B.4.2)
6. Diagnose, service, and adjust antilock brake system ABS wheel speed sensors and circuits following manufacturers’ recommended procedures (including voltage output, resistance, shorts to voltage/ground, and frequency data). (P1-III.B.4.5)
7. Inspect automatic traction control system; determine needed repairs. (P3-A4/7)
8. Listen to and verify operator’s complaint; review past maintenance documents; determine needed repairs. (III)
9. Diagnose poor stopping, premature wear, pulling, dragging or pedal feel problems caused by the hydraulic system; determine needed action. (P1-III.B.1.1)
10. Check brake pedal pushrod length; adjust as needed. (P3-III.B.1.2)
11. Inspect and test master cylinder for internal/external leaks and damage; replace as needed. (P1-III.B.1.3)
12. Inspect for leaks and damage, brake lines, flexible hoses, and fittings; replace as needed. (P1-III.B.1.4)
13. Inspect and test metering (hold-off), load sensing/proportioning, proportioning, and combination valves; replace as needed. (P2-III.B.1.5)
14. Inspect and test brake pressure differential valve and warning lamp circuit switch, bulbs, wiring, and connectors; repair or replace as needed. (P2-III.B.1.6)
15. Inspect and clean wheel cylinders; replace as needed. (P1-III.B.1.7)
16. Inspect and clean disc brake caliper assemblies; replace as needed. (P1-III.B.1.8)
17. Inspect/test brake fluid; bleed and/or flush system; determine proper fluid type. (P1-III.B.1.9)
18. Test and adjust brake stop light switch, bulbs, wiring, and connectors; repair or
G. Inspect and Repair Mechanical Brake Systems.
1. Listen to and verify operator's complaint; review past maintenance documents; determine needed repairs. (III)
2. Diagnose poor stopping, brake noise, premature wear, pulling, grabbing, dragging, or pedal feel problems; determine needed action. (P1-III.B.2.1)
3. Inspect and measure brake drums and rotors; perform needed action. (P1-III.B.2.2)
4. Inspect and measure drum brake shoes and linings; inspect mounting hardware, adjuster mechanisms, and backing plates; perform needed action. (P1-III.B.2.3)
5. Inspect and measure disc brake pads/linings; inspect mounting hardware; perform needed action. (P1-III.B.2.4)
6. Check parking brake operation; inspect parking brake application and holding devices; adjust and replace as needed. (P1-III.B.2.5)

H. Inspect, Adjust and/or Replace Brake Related Components.
1. Diagnose poor stopping problems caused by the brake assist (booster) system; determine needed action. (P2-III.B.3.1)
2. Inspect, test, repair, or replace power brake assist (booster), hoses, and control valves; determine proper fluid type. (P2-III.B.3.2)
3. Check emergency (back-up, reserve) brake assist system. (P2-III.B.3.3)
4. Test and adjust brake stop lamp switch, bulbs, wiring, and connectors; repair or replace as needed.
5. Remove and replace axle wheel assembly.
6. Clean, inspect, lubricate, or replace wheel bearings; replace seals and wear rings.
7. Adjust axle wheel bearings.

I. Discuss Wheel and Tire Fundamentals and Maintenance.
1. Name the two major wheel designs used on heavy-duty trucks and list advantages of each.
2. Compare standard and wide base wheel systems and stud-and hub-piloted mountings.
3. Identify the common types of tire-to-rim hardware and describe their functions.
4. Discuss the importance of properly matching and assembling tire and rim hardware.
5. List safety procedures for handling and servicing wheels and tires.
6. Identify the two types of brake drum mounting configurations.
7. Perform wheel runout checks and adjustments.
8. Properly match tires in dual and tandem mountings.
9. List the major components of both grease and oil lubricated wheel hubs, including methods for securing them to the wheel spindle or axle.

J. Inspect, Service and Repair Wheels, Tires and Related Components.
1. Diagnose unusual tire wear patterns, check tread depth, mismatched tread...
2. Diagnose wheel/tire vibration, shimmy, pounding, hop (tramp) problems; determine needed action. (P2-IV.D.2)
3. Inspect wheels, rims, spacers, clamps, studs, and nuts; replace as needed.
4. Inspect multi-piece tire and wheel assembly in accordance with manufacturers' recommended procedures.
5. Measure wheel and tire radial and lateral runout; determine needed repairs.
6. Inspect tires; check air pressure; determine needed repairs.
7. Adjust steering and/or drive axle wheel bearings.
8. Inspect, adjust, repair, or replace front wheel speedometer drive assembly.
9. Inspect, and service fifth wheel assemblies and pintle hook; determine needed repairs.
10. Inspect frame and frame members for cracks, breaks, corrosion, distortion, elongated holes, looseness, and damage; determine needed repairs. (P1-IV.E.3)
11. Inspect, install, or repair frame hangers, brackets, and cross members in accordance with manufacturers' recommended procedures. (P3-IV.E.4)
12. Inspect, test, and adjust cab air suspension components: lines, hoses, fittings, air springs bushings, shocks, valves, and linkages; determine needed repairs.
13. Inspect, test, and adjust driver's air seat components; determine needed repairs.
14. Inspect and adjust fifth wheel, pivot pins, bushings, locking jaw mechanisms, and mounting bolts; determine needed action. (P1-IV.E.1)
15. Inspect sliding fifth wheel, tracks, stops, locking systems, air cylinders, springs, lines, hoses, and controls. (P1-IV.E.2)
16. Inspect, repair, or replace pintle hooks and draw bars. (P1-IV.E.5)

1 ODCTE Objective
Coding indicates NATEF alignment.
All unmarked objectives are TTC instructor developed.

Teaching Methods: The class will primarily be taught by the lecture and demonstration method and supported by various media materials to address various learning styles. There will be question and answer sessions over material covered in lecture and media presentations. Supervised lab time is provided for students to complete required projects.

Grading Procedures: 1. Students are graded on theory and shop practice and performance.
2. Each course must be passed with seventy (70%) percent or better.
3. Grading scale: A=90-100%, B=80-89%, C=70-79%, D=60-69%, F=50-59%.

Description of Classroom, Laboratories, and Equipment:
Tulsa Technology Center campuses are owned and operated by Tulsa Technology Center School District No. 18. All programs provide students the opportunity to work with professionally certified instructors in modern, well-equipped facilities.
Available Certifications/ College Credit:

The student may be eligible to take state, national or industry exam after completion of the program. College credit may be issued from Oklahoma State University-Okmulgee or Tulsa Community College. See program counselor for additional information.

College Credit Eligibility:

The student must maintain a grade point average of 2.0 or better.