National Transportation Safety Board

Office of Railroad, Pipeline and Hazardous Materials Investigations

Washington, D.C. 20594

# Derailment & Hazardous Materials Release with Fire of Train UEGKOT-09

Union Pacific Railroad Company (UP) Unit Train

Graettinger, Iowa

March 10, 2017

## Mechanical Group Factual Report

## Accident

| | |
|---|---|
| NTSB Accident Number: | DCA17MR007 |
| Date of Accident: | March 10, 2017 |
| Time of Accident: | 12:50 a.m. (CDT) |
| Type of Trains: | UEGKOT-09 (Unit Train) |
| Railroad Owner: | UP |
| Train Operator: | UP |
| Fatalities: | 0 |
| Injuries: | 0 |
| Location of Accident: | Graettinger, Iowa |

## Mechanical Group Members

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## Accident Summary

For a summary of the accident, refer to the *Accident Summary* report, within this docket, NTSB Docket DCA17MR007.

## Train Consist

Train UEGKOT-09 consisted of two locomotives units at the front of the train, 98 loaded tank cars, 2 buffer cars full of sand (one at the front and one at the rear) and a locomotive at the rear of the train configured as a distributed power unit (DPU). The train weighed 12,699 trailing tons and was 6,215 feet in length. The train was hauling ethanol.

## Pre- Accident Inspection

The train crew for Train UEGKOT-09 performed a Federal Railroad Administration (FRA) Class I brake test - initial terminal inspection at Great Plains LLC in Superior, Iowa, on March 9, 2017 at 10:22 pm CST. Superior is just less than 20 miles from the accident location. The train destination was Texas City, Texas, scheduled to arrive on March 13, 2017. A required Class IA – 1000-mile brake test was scheduled en route at Parsons, Kansas. Records showed there were no exceptions were recorded in the collected records.

## Records Review

During the on-scene phase of this investigation, investigators collected the daily and periodic inspection records from all locomotives involved in the accident. The daily inspection requirements are outlined in 49 CFR 229.21. This Federal regulation requires that each locomotive in use shall be inspected at least once during each calendar day. A written report of the inspection shall be made. This report shall contain the name of the carrier; the initials and number of the locomotive; the place, date and time of the inspection; a description of the non-complying conditions disclosed by the inspection; and the signature of the employee making the inspection.

Investigators reviewed the daily inspection records for all locomotives in the train consist. The records were in compliance with Federal regulations. The last documented inspections were performed March 10, 2017, at 12:01 a.m., in Superior (DR069) where the train originated. A required inspection at an interval not to exceed 33 days was performed by a qualified mechanical inspector (QMI) on March 8, 2017.

Periodic inspection requirements for locomotives are outlined in 49 CFR 229.23. Each periodic inspection is to be recorded on FRA form F6180-49A. The interval between any two periodic inspections cannot exceed 92-days unless the locomotive is equipped with advanced micro-

processor based on-board electronic condition monitoring controls. The interval for such locomotives types is 184-days.

Investigators reviewed the periodic maintenance records for all locomotives in the train consist. The records were in compliance with the Federal regulations. The required inspections were performed on March 3, 2017, at South Morrill, Nebraska (lead locomotive), on January 10, 2017, at Houston, Texas (trailing locomotive), and on January 13, 2017, at North Little Rock, Arkansas (DPU).

## Wreckage Description

A review of the leading locomotive's event recorder showed Train UEGKOT-09 was approaching the timber bridge over Jack Creek located at MP 57 traveling at about 28 MPH. About 12:50 a.m., an unintended emergency brake was initiated. The train separated between the 20th and 21st cars. During the emergency response, the train crew moved the locomotives and the non-derailed cars away from the point-of-derailment (POD) and the fire that resulted from the train accident.

As a result of the accident the 21st through the 40th cars in the train were derailed (see summary below):

1. DBUX 301674 (sequence 21) – burned, lying on left side
2. TAEX 2893 (sequence 22) – burned, breached, nearly inverted, lying in Jack Creek
3. TILX 199147 (sequence 23) – burned, lying on side in Jack Creek
4. TCBX 198194 (sequence 24) – burned, nearly inverted, lying in Jack Creek
5. CTCX 732108 (sequence 25) – burned, overturned about 90 degrees, partially underneath sequence 28
6. TILX 197694 (sequence 26) – burned, overturned about 90 degrees
7. DBUX 302834 (sequence 27) – breached, nearly inverted
8. DBUX 302746 (sequence 28) – overriding, listing about 45 degrees, lying in Jack Creek
9. TAEX 2909 (sequence 29) – burned, AEI read issue with GATX 203812
10. WCHX 30078 (sequence 30) – active fire, breached, severely buckled, listing about 10 degrees
11. WCHX 30098 (sequence 31) – active fire, overriding
12. TILX 199819 (sequence 32) – burned, breached
13. TILX 195202 (sequence 33) – burned, breached, listing about 22 degrees
14. CTCX 731383 (sequence 34) – burned, upright
15. TILX 195386 (sequence 35) – A-end, end crushed (no apparent penetration)
16. CTCX 731997 (sequence 36) – burned, breached, listing about 22 degrees
17. TILX 197615 (sequence 37) – A-end, B-end, derailed upright
18. TILX 199168 (sequence 38) – A-end, B-end, derailed, listing about 22 degrees
19. TILX 191239 (sequence 39) – A-end, B-end, derailed, upright
20. DBUX 301606 (sequence 40) – B-end (lead truck), derailed, upright

**Figure 1-Aerial Photograph of accident location**

**Figure 2-Aerial photograph of the derailed tank cars**

## Equipment Post Accident Inspections

On March 10, 2017, investigators inspected the lead locomotive consist at the point where they were repositioned east of the derailment site. The inspections of the locomotives revealed that one of two headlights were inoperative (burned out) on the lead locomotive. The rear continuous barrier chain was improperly secured on the trailing locomotive.

Investigators also inspected the distributive power unit (DPU) locomotive that was the end of the train and moved west of the derailment site. Investigators found that the air compressor governor was defective on the DPU causing the unit to continuously run and vent excess pressure. This condition did not affect the charging or maintaining of brake pipe pressure.

None of these conditions were causal to the train accident

On March 11, 2017, investigators inspected the non-derailed cars (1st through the 20th). The locomotives and the cars were oriented just as they were after passing over the timber bridge. The train was travelling in an easterly direction—right-side wheels of the lead locomotive (and trailing locomotives) and tank cars were running on the south rail. Several wheels on the south side of the train exhibited fresh horizontal damage on the wheel tread (e.g. impressions perpendicular to the wheel tread). Investigators did not observe any horizontal damage to the tread on the wheels that traveled over the north rail. The wheel damage observed was more pronounced on south side

wheels of tank cars further from the locomotive consist. (see Figure 7 at the end of this report for recorded notes from Mechanical Group inspections)

The series of photographs below (figures 3 through 6) document the location and position of remarkable horizontal damage on a southside wheel tread (on TCBX 198115) that traveled over the point-of-derailment (POD). In the photographs, note that there are two marks on the tread.

Figure 3-TCBX 198115 (Photo FRA)


Figure 4-TCBX 198115 wheel damage. (Photo FRA)


Figure 5- TCBX 198115 wheel damage (Photo FRA)


Figure 6- TCBX 198115 wheel damage (Photo FRA)

On March 11, 2017, investigators completed a mechanical walking inspection and an FRA Class 1 brake test on all cars that did not derail. Post-accident inspections and tests of the non-derailed cars in the train revealed very few exceptions (defects). All cars inspected and tested revealed good integrity of the train air brake system. All brakes applied and released as designed. None of the conditions observed on the cars were causal regarding the train accident.

Investigators examined the derailed tank cars, truck assemblies and 80-wheel sets after the post recovery. All wheels were found to be intact except for two broken wheels found to be fractured (derailment damage). Several wheels showed indications of thermal exposure consistent with the

tank car fire. None of the wheels from cars behind the 20th car from the lead locomotives exhibited any horizontal wheel marks on the wheel tread.

## Damage Estimates

UP has estimated the damage to the equipment about $1.4 million.

## In-Service Tank Car Net Braking Ratio Testing

On June 19, 2017, two NTSB investigators traveled to the Trinity Rail tank car maintenance facility in Saginaw, TX to witness in-service tank car net braking ratio (NBR) tests on three (3) exemplar undamaged tank cars from accident train UEGKOT-09. The brake system tests were conducted in response to an NTSB request to quantify tank car NBR values for representative in-service cars. The results of the testing are presented in the official docket for this investigation.

Figure 7 – Mechanical Group inspection notes for Train UEGKOT-09

Deliver to: OSUE531

Site Monitor's AEI Consist Information
(Head to Rear)

Train ID: UEGKOT 09 Date/Time: 03/10/17 00:26
Site: 509 Estherville East Circ7: DR058

Locomotives

| SEQ NBR | CAR NBR | TYPE | EQ.OR | AXLES | FUEL | SPEED | TAG ST |
|---|---|---|---|---|---|---|---|
| 001 | UP 005666 | D | A | 6 | N/A | 23 | G |
| 002 | UP 008376 | D | A | 6 | N/A | 23 | G |
| 103 | UP 008037 | D | B | 6 | N/A | 30 | G |

Rail Equipment

| SEQ NBR | CAR NBR | TYPE | EQ.OR | AXLES | PLTFM | SPEED | TAG ST | CVR/DYN/RAW |
|---|---|---|---|---|---|---|---|---|
| 001 | GACX 056766 | R | A | 4 | 1 | 24 | G | |
| 002 | CITX 220168 | R | B | 4 | 1 | 24 | G | |
| 003 | TCBX 192256 | R | A | 4 | 1 | 24 | G | |
| 004 | TCBX 193731 | R | B | 4 | 1 | 24 | G | |
| 005 | TCBX 192230 | R | A | 4 | 1 | 24 | G | |
| 006 | TILX 320113 | R | B | 4 | 1 | 24 | G | |
| 007 | TILX 197715 | R | B | 4 | 1 | 24 | G | |
| 008 | TILX 198343 | R | B | 4 | 1 | 24 | G | |
| 009 | SHPX 209530 | R | B | 4 | 1 | 24 | G | |
| 010 | TAEX 001077 | R | A | 4 | 1 | 24 | G | |
| 011 | TAEX 001184 | R | A | 4 | 1 | 24 | G | |
| 012 | DBUX 302558 | R | A | 4 | 1 | 25 | G | |
| 013 | TILX 199805 | R | A | 4 | 1 | 25 | G | |
| 014 | TILX 318593 | R | B | 4 | 1 | 25 | G | |
| 015 | DBUX 301604 | R | B | 4 | 1 | 25 | G | |
| 016 | TILX 199046 | R | B | 4 | 1 | 25 | G | |
| 017 | TCBX 198068 | R | B | 4 | 1 | 25 | G | |
| 018 | TILX 198094 | R | B | 4 | 1 | 25 | G | |
| 019 | DBUX 302412 | R | B | 4 | 1 | 25 | G | |
| 020 | TCBX 198115 | R | A | 4 | 1 | 25 | G | |
| 021 | DBUX 301674 | R | A | 4 | 1 | 25 | G | |
| 022 | TAEX 002893 | R | A | 4 | 1 | 26 | G | |
| 023 | TILX 199147 | R | A | 4 | 1 | 26 | G | |
| 024 | TCBX 198194 | R | A | 4 | 1 | 26 | G | |
| 025 | CTCX 732108 | R | B | 4 | 1 | 26 | G | |
| 026 | TILX 197694 | R | A | 4 | 1 | 26 | G | |
| 027 | DBUX 302834 | R | B | 4 | 1 | 26 | G | |
| 028 | DBUX 302746 | R | B | 4 | 1 | 26 | G | |
| 029 | TAEX 002909 | R | B | 4 | 1 | 26 | G | |

Sequence numbers (non-derailed front portion of Train Symbol UEGKOT-09) in yellow highlight exhibited horizontal marks on the wheel tread (south rail) as follows:
004 - L2, L3
007 - L2
008 - L2
010 - R4, R3
011 - R4, R3, R2, R1
012 - R4, R2
013 - R4, R2, R1
014 - L1, L2, L3
015 - L1, L4
016 - L1, L2, L4
017 - L1, L2, L3, L4
019 - L1, L3, L4
020 - R4, R3, R2, R1; B-end, knuckle broke

Sequence numbers 21 through 29 were derailed as follows:
21 - burned, lying on left side
22 - burned, breached, nearly inverted, in water
23 - burned, lying on its side, in water
24 - burned, nearly inverted, in water
25 - burned, overturned about 90 degrees, partially underneath 28
26 - burned, overturned about 90 degrees
27 - breached, nearly inverted
28 - overriding, listing about 45 degrees, in water
29 - burned, AEI read issue with GATX 203812

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 030 | WCHX 030078 R | | | A | 4 | 1 | 26 | |
| 031 | WCHX 030098 R | | | A | 4 | 1 | 26 | |
| 032 | TILX 199819 R | A | 4 | 1 | 26 | G | | |
| 033 | TILX 195202 R | A | 4 | 1 | 26 | G | | |
| 034 | CTCX 731383 R | B | 4 | 1 | 27 | G | | |
| 035 | TILX 195386 R | A | 4 | 1 | 27 | G | | |
| 036 | CTCX 731997 R | A | 4 | 1 | 27 | G | | |
| 037 | TILX 197615 R | A | 4 | 1 | 27 | G | | |
| 038 | TILX 199168 R | B | 4 | 1 | 27 | G | | |
| 039 | TILX 191239 R | B | 4 | 1 | 27 | G | | |
| 040 | DBUX 301606 R | B | 4 | 1 | 27 | G | | |
| 041 | TILX 199067 R | A | 4 | 1 | 27 | G | | |
| 042 | DBUX 302766 R | B | 4 | 1 | 27 | G | | |
| 043 | TCBX 198257 R | A | 4 | 1 | 27 | G | | |
| 044 | TILX 199462 R | B | 4 | 1 | 27 | G | | |
| 045 | WCHX 030062 R | | | B | 4 | 1 | 27 | |
| 046 | UTLX 210649 R | A | 4 | 1 | 27 | G | | |
| 047 | TCBX 198147 R | A | 4 | 1 | 27 | G | | |
| 048 | CTCX 731722 R | B | 4 | 1 | 27 | G | | |
| 049 | TILX 198350 R | B | 4 | 1 | 28 | G | | |
| 050 | TILX 194940 R | A | 4 | 1 | 28 | G | | |
| 051 | TILX 197761 R | B | 4 | 1 | 28 | G | | |
| 052 | CTCX 731432 R | A | 4 | 1 | 28 | G | | |
| 053 | TILX 198216 R | A | 4 | 1 | 28 | G | | |
| 054 | TILX 198282 R | A | 4 | 1 | 28 | G | | |
| 055 | TILX 194948 R | A | 4 | 1 | 28 | G | | |
| 056 | TILX 198035 R | A | 4 | 1 | 28 | G | | |
| 057 | TILX 192027 R | A | 4 | 1 | 28 | G | | |
| 058 | DBUX 302744 R | B | 4 | 1 | 28 | G | | |
| 059 | DBUX 302714 R | A | 4 | 1 | 28 | G | | |
| 060 | TILX 198364 R | B | 4 | 1 | 28 | G | | |
| 061 | TILX 195238 R | A | 4 | 1 | 28 | G | | |
| 062 | CTCX 732482 R | A | 4 | 1 | 28 | G | | |
| 063 | DBUX 300569 R | B | 4 | 1 | 28 | G | | |
| 064 | TILX 199980 R | A | 4 | 1 | 28 | G | | |
| 065 | WCHX 030063 R | | | A | 4 | 1 | 28 | G |
| 066 | TCBX 197606 R | B | 4 | 1 | 29 | G | | |
| 067 | TEIX 030133 R | B | 4 | 1 | 29 | G | | |
| 068 | TILX 198681 R | B | 4 | 1 | 29 | G | | |
| 069 | TILX 194336 R | A | 4 | 1 | 29 | G | | |
| 070 | DBUX 302767 R | A | 4 | 1 | 29 | G | | |
| 071 | TILX 199160 R | A | 4 | 1 | 29 | G | | |
| 072 | CTCX 731749 R | B | 4 | 1 | 29 | G | | |
| 073 | TCBX 198126 R | A | 4 | 1 | 29 | G | | |

Sequence numbers 30 through 40 were derailed as follows:
30 - active fire, breached, severely buckled, listing about 10 degrees
31 - active fire, overriding
32 - burned, breached
33 - burned, breached, listing about 22 degrees
34 - burned, upright
35 - A-end, end crushed (no apparent penetration)
36 - burned, breached, listing about 22 degrees
37 - A-end, B-end, derailed, upright
38 - A-end, B-end, derailed, listing about 22 degrees
39 - A-end, B-end, derailed, upright
40 - B-end (lead truck), derailed, upright

Sequence numbers 41 through 100 were not derailed.

| | | | | | | |
|---|---|---|---|---|---|---|
| 074 | TCBX 197631 R | B | 4 | 1 | 29 | G |
| 075 | TILX 320122 R | B | 4 | 1 | 29 | G |
| 076 | DBUX 300858 R | A | 4 | 1 | 29 | G |
| 077 | TILX 198558 R | B | 4 | 1 | 29 | G |
| 078 | SHPX 208992 R | A | 4 | 1 | 29 | G |
| 079 | TILX 195016 R | A | 4 | 1 | 29 | G |
| 080 | TILX 198660 R | B | 4 | 1 | 29 | G |
| 081 | CITX 220196 R | A | 4 | 1 | 29 | G |
| 082 | SHPX 208987 R | B | 4 | 1 | 29 | G |
| 083 | TILX 198279 R | B | 4 | 1 | 30 | G |
| 084 | TILX 197582 R | B | 4 | 1 | 30 | G |
| 085 | TILX 195097 R | A | 4 | 1 | 30 | G |
| 086 | CTCX 731430 R | B | 4 | 1 | 30 | G |
| 087 | TILX 198160 R | A | 4 | 1 | 30 | G |
| 088 | TCBX 198183 R | A | 4 | 1 | 30 | G |
| 089 | TILX 199577 R | A | 4 | 1 | 30 | G |
| 090 | TILX 199545 R | B | 4 | 1 | 30 | G |
| 091 | TCBX 199295 R | A | 4 | 1 | 30 | G |
| 092 | TAEX 001134 R | B | 4 | 1 | 30 | G |
| 093 | TAEX 001187 R | A | 4 | 1 | 30 | R |
| 094 | TCBX 198191 R | B | 4 | 1 | 30 | G |
| 095 | DBUX 208809 R | A | 4 | 1 | 30 | G |
| 096 | TILX 199808 R | B | 4 | 1 | 30 | G |
| 097 | TILX 199176 R | B | 4 | 1 | 30 | G |
| 098 | TILX 193912 R | B | 4 | 1 | 30 | G |
| 099 | DBUX 302126 R | B | 4 | 1 | 30 | G |
| 100 | MP 718012 R | A | 4 | 1 | 30 | G |

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End Of Train Equipment

NONE.

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END OF REPORT