AUTOMATION OF MOVABLE BRIDGES
Conrail’s operation in New Jersey requires manning of movable bridges to comply with various marine regulations

• 1/3 of Conrail’s movable bridges were allocated to the Shared Assets territory in 1999

• 9 were in the New Jersey area
  - 5 bridges service pleasure craft only
  - 4 bridges service commercial shipping

• Code of Federal Regulations mandated specific operations for all movable bridges

(continued)
Conrail’s operation in New Jersey requires manning of movable bridges to comply with various marine regulations

- Hours of operation based upon CFR requirements
  - 6 bridges utilize BMWE craft (15 positions)
  - 3 bridges utilize TCU craft (13 positions)

- Coast Guard monitors bridge operations and Conrail’s compliance with regulations

- Increasing marine activity coupled with bridge operator attrition presented an opportunity to get serious about automation of movable bridges at Conrail
4 movable bridge candidates were identified in 2000 for automation projects

- Secondary and industrial track train operation
- Waterways handled pleasure craft only
- Seasonal operation of bridge
- Increasing complaints from boating public and Coast Guard regarding hours of operation and operator presence
- Increasing overtime required to meet demand and satisfy complaints
- Near-term requirement to hire bridge operators
Between 2000-2003, new technology interfaced with old infrastructure to allow for the automation of movable bridges on Conrail

• Each bridge had unique challenges to solve

• Each automation solution was tailored to the specific marine and train operation at that location

• Electrical, mechanical, and signal modifications were necessary to support bridge automation
  – Programmable Logic Controller

• Automation plans were submitted to the Coast Guard for their review and approval for each bridge

• Concurrently, Conrail finalized design and requested authorization for capital expenditures

(continued)
Between 2000-2003, new technology interfaced with old infrastructure to allow for the automation of movable bridges on Conrail

- In the end, 3 different applications were chosen for bridge control:
  - Microwave link path between one bridge and another 24/7 manned bridge
  - DTMF radio control allows train crews to operate two bridges
  - Direct train control by Mt. Laurel Train Dispatch Center was the best solution for another location

- Upon completion, the automated bridges were bulletined in service and the Code of Federal Regulation for operation at each location was modified
Darby Creek Bridge
Darby Creek Bridge

Description
Bridge No. B -1.67 – Chester Industrial Track
Thru-Girder, Open Deck, Bascule Draw
Located in Eddystone, Pennsylvania
Waterway – Darby Creek
Built in 1923

Railroad Operation
Number of Tracks – 2
Track Speed – 15 MPH
Train Movements Per Day - 6

Marine Operation
Marine Traffic – Pleasure Craft
CFR Regulation – Open May 15\textsuperscript{th} thru October 15\textsuperscript{th}
Open with 24 hour notice
October 16\textsuperscript{th} thru May 14\textsuperscript{th}
### Bridgeport Movable Bridge

#### Description
Bridge No. D - 20.79 – Penns Grove Secondary
Thru-Girder, Open Deck, Swing Span
Located in Bridgeport, New Jersey
Waterway – Raccoon Creek
Built in 1919

<table>
<thead>
<tr>
<th>Railroad Operation</th>
<th>Marine Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Tracks – 1</td>
<td>Marine Traffic – Pleasure Craft</td>
</tr>
<tr>
<td>Track Speed – 10 MPH</td>
<td>CFR Regulation – Open March 1\textsuperscript{st} thru November 30\textsuperscript{th}</td>
</tr>
<tr>
<td>Train Movements Per Day - 6</td>
<td>Open with 4 hour notice December 1\textsuperscript{st} thru February 28\textsuperscript{th}</td>
</tr>
</tbody>
</table>
Paulsboro Bridge
Paulsboro Bridge

Description

Bridge No. D -13.70 – Penns Grove Secondary
Deck Girder, Open Deck, A-Frame Swing
Located in Paulsboro, New Jersey
Waterway – Mantua Creek
Built in 1917

Railroad Operation
Number of Tracks – 1
Track Speed – 15 MPH
Train Movements Per Day – 10

Marine Operation
Marine Traffic – Pleasure Craft
CFR Regulation – Open March 1st thru November 30th
Open with 4 hour notice
December 1st thru February 28th
Rahway River Bridge
Rahway River Bridge

Description

Bridge No. B -14.49 – Chemical Coast Secondary
Thru-Girder, Open Deck, Bascule Draw
Located in West Carteret, New Jersey
Waterway – Rahway River
Built in 1921

Railroad Operation
Number of Tracks – 2 (1 active)
Track Speed – 20 MPH
Train Movements Per Day – 12

Marine Operation
Marine Traffic – Pleasure Craft
CFR Regulation – Open April 1st thru November 30th
Open with 4 hour notice
December 1st thru March 31st
Darby Creek Bridge
## Darby Creek Bridge Operation

<table>
<thead>
<tr>
<th>AUTOMATION REQUIREMENT:</th>
<th>Bridge is left in the open position</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECHNOLOGY:</td>
<td>Vital Microprocessor Serial Link between Darby Bridge and Delair Bridge</td>
</tr>
<tr>
<td>CLOSING BRIDGE:</td>
<td>Bridge operator at Delair Bridge operates bridge by remote control upon train arrival</td>
</tr>
<tr>
<td>OPEN BRIDGE:</td>
<td>When track circuit over the bridge is clear, the bridge operator at Delair can open the bridge</td>
</tr>
</tbody>
</table>
Darby Creek Bridge Operation (before)
Darby Creek Bridge Operation (after)
Darby Creek Bridge
Paulsboro Bridge
Bridgeport Movable Bridge
Paulsboro and Bridgeport Bridge Operation

<table>
<thead>
<tr>
<th>AUTOMATION REQUIREMENT:</th>
<th>Bridge is left in the open position</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECHNOLOGY:</td>
<td>Train crew operates bridge using DTMF radio with keypad in engine or on portable radio</td>
</tr>
<tr>
<td>CLOSING BRIDGE:</td>
<td>With approach track circuit occupied, crew member enters access code on keypad</td>
</tr>
<tr>
<td>EMERGENCY STOP:</td>
<td>Enter access code and # key</td>
</tr>
<tr>
<td>OPEN BRIDGE:</td>
<td>Bridge will open automatically when track circuits are clear</td>
</tr>
</tbody>
</table>
Paulsboro Bridge Operation (before)
Paulsboro Bridge Operation (after)
## Rahway River Bridge Operation

<table>
<thead>
<tr>
<th>AUTOMATION REQUIREMENT:</th>
<th>Bridge is left in the open position</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECHNOLOGY:</td>
<td>Vital Processor linked to Mt. Laurel Dispatch Office using Genesis Protocol and RFL carrier</td>
</tr>
<tr>
<td>CLOSING BRIDGE:</td>
<td>Prior to train arrival, the dispatcher operates the bridge remotely from his work station</td>
</tr>
<tr>
<td>OPEN BRIDGE:</td>
<td>With track circuits cleared, train dispatcher can open the bridge</td>
</tr>
</tbody>
</table>
Rahway River Bridge
Conrail enjoys the on-going benefits and efficiencies of movable bridge automation and continues to explore future opportunities.

- Bridge automation projects produced a significant ROI
- Re-deployment of the existing work force
- Reduced hiring requirement for future bridge operator positions
- Elimination of train delays due to operator availability

(continued)
Conrail enjoys the on-going benefits and efficiencies of movable bridge automation and continues to explore future opportunities

- Reduction in complaints from boat owners regarding bridge openings
- Improved relationship with the Coast Guard
- Building on these successes, Conrail is reviewing the cost and benefits of our remaining bridge automation challenges
Delair Bridge
Upper Bay Bridge
Hack Bridge
The success of each of the projects was primarily due to the interaction and cooperation of many agencies and organizations:

- Conrail’s Communication & Signal and Bridges & Building Departments
- Conrail’s Labor Relations Department
- CSXT and NSC for their support of these capital projects
- United States Coast Guard
- North American Signal, Inc.
- Various marina owners and boating public during public comment period
Questions and Answers