Dallas/Fort Worth International Airport

Terminal Renewal & Improvement Program (TRIP)

International Facility Management Association
Airport Facilities Council Presentation
Spring Conference

May 13, 2015
TRIP Purpose and Need

- Entering new era in Airport’s lifecycle that requires a new long-range vision
  - Aging Infrastructure
    - 35-40 year-old Terminal Systems
    - Maintenance costs high
  - Changes in Aviation Industry
    - Focus on operational efficiency and cost reductions
    - Enhanced security requirements
    - Increase non-airline revenue generation
    - Provide access to technology
  - Competitive Landscape
    - Repeal of Wright Amendment in 2014
    - Other hub airports have already begun their airport renewal programs

DFW International Airport
- 18,000 acres
- 7 runways
- 6 million ft$^2$ terminal space
TRIP Scope

- Terminals – A, B, C & E
  - Complete replacement of MEP and data systems
  - Consolidation of Concession areas
  - Re-orientation of Security Check Points
  - Enhanced Terminal entries
  - Replace interior finishes

- Baggage Handling Systems
  - Terminal B partial replacement
  - Terminal E full replacement
  - System rehabilitation in Terminals A & C

- Landside
  - Construction of DART and FWTA Rail Stations
  - Parking Garage repairs
  - Replacement garage at Terminal A
Terminal Experience
Example Skylink Ceiling
Progress Photos

B/C Infill - MEP’s in ATO Hall

Terminal E Satellite - Lower Level Club Framing & Utilities
Ticketing Hall

- Incorporate more self-service technologies
- Provide premium check-in
- Increase passenger flows
- Create sense of space with higher ceilings and better lighting
- Self serve bag tagging and belt delivery
Reconfigured Ticketing Hall and Security Checkpoint
Security Checkpoint

- Consolidate and expand checkpoints
- Rolling out improved technology to improve passenger flow
- Incorporate TSA future technology requirements
- More queuing space
- Longer divestment and recomposition areas
HVAC Equipment and Systems

- AHUs designed around Temptrol FANWALL (2.0 Hybrid)
  - Uses multiple smaller higher-efficiency fans driven by VFDs
  - FANWALL motors run closer to their peak efficiency at partial conditions than larger single motor fans

www.temtrol.com
Hydronic System

- New hydronic pump rooms and equipment
- New heating (10”) and chilled water (14”) main piping
  - Full size hydronic pipe runs full length of terminal
  - Lower pressure drop
  - Increased capacity
Hydronic System (continued)

- In 2011, Texas A&M Energy Systems Laboratory (ESL) was engaged by TRIP to model the hydronic heating and cooling system
- **Primary Study Objective:**
  - Determine most energy efficient CUP pump strategy
- **Results and Conclusions:**
  - Tertiary Pumps in a dual feed arrangement will save approximately $20,000 per year in operating costs (based on data at time of study)

Dual Feed, CUP+Tertiary Pump
Natural Gas

- Before TRIP, Terminals A, B, C and E do not have natural gas
- Mainly used for concessions cooking operations
- Thermal expansion
Electrical

- **Lighting**
  - LED Lighting
    - More light output
    - Lower energy usage per fixture
  - High-efficiency T5 fluorescent fixtures
    - T5 fixtures use roughly half the energy of the old style T12 fixtures.
- **Daylighting**
  - Lighting can be dimmed in areas where natural light is available
- **Occupancy Sensor**
  - Turns lighting off while an area is unoccupied
- **Lighting Control System**
Lighting Examples

LED Back-lit Signage

Concourse Lighting Design
Electrical - Power Factor (PF) Correction Capacitor

- New Main-Tie-Main in each Oncor Vault
- Cost savings on electrical utility bill with new PF correction system
- Oncor customers incur a penalty if the power factor is below 95%.
- Prior to TRIP, Terminal B Vault D had a power factor of 83%
  - TRIP implemented Power Factor Correction on all new Main-Tie-Mains
  - After PF correction, Vault D is at a 95% PF
- The increase to 95% PF on Vault D resulted in a cost savings of $13,260 for FY2014
- TRIP is adding PF capacitors on all 17 of the new Main-Tie-Mains:
  - Estimated savings per year of 17 PF correction units is $225,000/yr
Plumbing/Fire Protection

- New below grade grease interceptors
- Heat trace on grease waste lines
- New fire protection: Dry and wet systems
- Nitrogen generators
- New valve rooms and headers for domestic water
  - Stainless steel
  - Galvanized
- Condition of existing under slab cast-iron sanitary lines
  - As you would expect for 30+ year old sanitary lines
  - Dig up and replace? Costly!
  - In-situ rehab? Pipe burst, etc.
TRIP Technology

Building Information Modeling

- Engineers are designing in 2D
- Contractors are modeling in Revit (3D)
- All models are integrated in Navisworks
- Clash detection in model minimizes field conflicts
- Allows for off-site fabrication
  - Cost savings
  - Speeds installation
  - Cleaner / Safer site

Electronic Plan Tables

- Almost Paperless during design
  - Paper Consumption reduced by 90%
  - Cost savings of approx. $8 M
  - Utilizing Bluebeam on all reviews
  - Drawings are available in real time

- iPads being used in field in place of paper plans
Building Information Modeling (BIM)

- Is BIM Important?
TRIP Technology
Terminal Model
TRIP Technology
Building the Model
TRIP Technology
Clash Detection
- Monitors and controls energy systems within one Terminal
  - Provides near instant feedback on status of M/E/P systems
- Provide alarms and notifications of systems in need of repair
  - Properly maintained and functioning systems use less energy
- ASHRAE BACNet Protocol
- DFW Airport Controls Master Plan

Figure 1: Terminal/facility system architecture
Enterprise Integration and Operation System

- EIOS sits on top of all the individual Terminal BAS
- Interfaces with DFW Infor EAM CMMS system:
  - Provides real-time maintenance and equipment failure data to ETAM
- Energy management tool
  - Demand Response
  - Energy Analytics

Figure 1: Enterprise level system architecture
IT is more than fixing computers!

- Major coordination required!
- Many systems are network based
Commissioning Process
Functional Performance Forms

- Cx Team responsibility
- Automated Sequences
- Equipment based on specs
- Verification of the BAS
- Verification of Functionality
- No Accessibility Issues
- Equipment Maintainable
- No Sustainability issues
**Issues Log**

- Submitted for CMAR and AE team response

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<tr>
<th>Issue Ref</th>
<th>Date</th>
<th>System</th>
<th>Description of Issue</th>
<th>Photo Ref</th>
<th>Issue Type</th>
<th>Response</th>
<th>Status Open / Close</th>
<th>Resolution</th>
<th>Remarks / Notes</th>
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<td>50</td>
<td>02305653</td>
<td>HVAC-KS20</td>
<td>It was observed that only part of the HVAC associated with terminals are yet to be CMAR</td>
<td></td>
<td>Mechanical / Controls</td>
<td></td>
<td>Note 20:023 2019.06 is to be closed out by others. This item is outside of the contract scope of work. TRIP is coordinating with DFW/FTS on this issue. It is anticipated that the work will be completed by April 11, 2020</td>
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<tr>
<td>62</td>
<td>02305653</td>
<td>HVAC-KS20</td>
<td>Campus observed the gasket material was used to stop the space temperature issue at the terminal. Contractor will perform the task. HVAC was rehabilitated.</td>
<td></td>
<td>Controls</td>
<td></td>
<td>Note 20:023 2019.06 is to be closed out by others. This item is outside of the contract scope of work. TRIP is coordinating with DFW/FTS on this issue. It is anticipated that the work will be completed by April 11, 2020</td>
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TRIP Training Topics

- Equipment Start-Up and Shut Down
- Daily Operation
- Control Adjustments
- Trouble Shooting
- Servicing
- Preventative Maintenance
- Keys
- Passwords
- Special Considerations
Monthly Closeout Mtgs.

Purpose to establish Project Closeout milestones for TRIP projects.

Necessary to accommodate Stakeholders in pursuit of Final Acceptance

Coordination of Closeout Checklists for each Project

Interdepartmental teamwork
Dallas/Fort Worth International Airport

Terminal Renewal & Improvement Program “TRIP”