Winter Operations
Kelly Clark-Deice
Medardo Gomez-Equipment
Dusty Bills-Chemicals
Aircraft Deice Operations

- Establish policies and procedures
- Meet frequently to ensure efficiency and maintain environmental compliance
- Monitor tenant deice operations

- Control K3 deice pad during heavy GA traffic
- Coordinate secondary deicing during major snow events
Deicing Facilities

- State of the Art End of Runway Deicing Facilities.
- Use blenders and dispensers to distribute Type I and Type IV ADF.
- Fuel distribution system.
Deicing Pads

- 35 Designated Deicing Pads with 76 Acres of Deicing Surface Area.
- 52 underground actuated valves used to control ADF runoff.
Aircraft Deiced/ADF Applied

- 500,000 gallons applied annually.
- 9,500 aircraft deicing annually.
- Split 75% Type I and 25% Type IV.
Spent ADF Conveyance System

• Seven pump stations that convey the spent ADF to the Reclamation Plant.
• 5.5 miles of underground HDPE pipeline.
Salt Lake City Department of Airports

- Deicing Fluid Reclamation Plant.
- Facility has been operational since 2001.
- Process 3 million gallons of ADF entrained runoff annually.
Storage Lagoon

- Three 3.4 MM gallon storage lagoons.
- Spent ADF ranges in concentration from 2-7%
- Lined with floating cover.
Deicing Fluid Reclamation Facility

- 2.5 acre self-contained production facility.
- Three stage reclamation process:
  1. Pretreatment
  2. MVR Evaporator
  3. Distillation Column
Tank Farm

- Equipped with a 450,000 gallon concrete contained tank farm.
- 73,000 gallon SS product storage.
- 140,000 gallon feed tanks.
- 140,000 gallon lined waste storage tanks.
- 97,000 gallon of utility and process storage.
Pretreatment

• Chemical Treatment
• Plate/Frame Clarifier
• Water Softener
• Ultra Filter
• Ion Exchange
• Reverse Osmosis
Modutank

- Receives clean soft concentrated fluid from pretreatment process
- 520,000 gallon capacity.
- Storage Lagoon for MVR feed material.
- Lined with a floating cover.
- Glycol Concentration ranges from 5-9%.
Mechanical Vapor Recompression (MVR)

- Receives water from the Modutank.
- Three stage process:
  1. 1\textsuperscript{st} Affect – 15-25%
  2. 2\textsuperscript{nd} Affect – 45-60%
  3. Finisher – 60-85%
- Concentration driven by fan speed and feed rate.
- Average feed rate 50-52 GPM @ 5-8 % concentration.
Distillation Column

- Distillation Column processes 4-8 GPM.
- Converts 70-85% spent ADF glycol to 99-100% pure.
- Fully automated using PLC technology.
Carbon Polishing System

- 8,000 lb Carbon Capacity.
- Use 12X40 Lignite Carbon.
- Final polishing to improve color and remove odors.
Finished Product Sales

- To date SLCDA has sold 948K of recycled PG.
- Average sale price $3.61 per/gallon.
- Total revenue $3,275.594.
Control Room

- Control center for Pretreatment, MVR, Tank Farm and Distillation Column.
- System monitoring and operation from one central location.
- PLC and single loop controlled equipment.
Laboratory

- QA/QC laboratory.
- Spectrophotometer for wastewater COD analysis.
- Ph, TDS and TSS.
- BAS system monitoring of new end of runaway deicing valves.
Land Application Site

- Four Pivots with a 400 foot Spray Radius
- 4 -7 MM Gallons of wastewater with <1% glycol applied each year.
- Regulated By A Ground Water Permit Issue By The Division Of Water Quality
Ground Recovery Vehicle

- Primarily used for secondary deicing operations.
- Spill response scenarios.
- UANG and K3 spent ADF tank management.
QUESTIONS??

[Image of an American Airlines airplane on a snowy runway with ground crew vehicles]
Winter Operations: Equipment & Chemicals
Average Snowfall in Inches
Select Airports

- ANC 74.5
- SEA 6.8
- BOI 19.2
- SLC 56.2
- DEN 57.5
- MSP 54.4
- ORD 31.1
- MCI 13.4
- DFW 1.5
- JFK 26.9
- BUF 93.4
- IAD 22.0

Map showing the average snowfall in inches at select airports across the United States.
Snowfall SLC

Total Snowfall (Inches)

Average Season Snowfall 56.2”
Snow and Ice Control Plan
Required by the FAA

Must include procedures for:

- Prompt removal of snow, ice, and slush
- Positioning of snow banks or drifts away from aircraft movement areas
- Application of chemicals for snow and ice control
- Prompt notification to airport users on pavement conditions
Determining snow removal operations

- Priority one areas
- Traffic loads and criticality
- Airfield size and configuration
- Philosophy of operation
- Resources
TYPICAL SNOW ELEMENT

- Airport Duty Manager
- Sr. Maint. Supervisor (Shuttles)
- Element Supervisor
- Snowplow w/Broom (6 each)
- Snow Blower (2 each)
- Sander Truck (1 each)
- Potassium Acetate (Shuttles)
- Urea Truck (1 each)
- Fleet Shop Truck (1 each)
- Electrician Truck (1 each)
Airport Snow Removal Areas

54 Million Sq Ft of Airfield and Roadways
Snow and Ice Removal Equipment

- Runway/Taxiway Equipment
  - Runway Plows and Brooms
  - Liquid/Solid Deice Dispensers
  - Sand Dispensers
  - Friction Tester

- Ramp Equipment
  - Front End Loaders

350 Horsepower Snow Blower
6,500 Tons an Hour

375 Horsepower Front End Loader with 30’ Plow

325 Horsepower Plow with 20’ Wide Blade and 22’ Wide Broom
Ramps
Snow and Ice Removal Equipment

- Potassium Acetate (E36) – Liquid Anti-icer and Deicer
  - Prevents adhesion of ice and snow to the pavement
  - Effective down to -25°F

SLC Potassium Acetate Usage

<table>
<thead>
<tr>
<th>Year</th>
<th>Gallons</th>
<th>Inches</th>
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</thead>
<tbody>
<tr>
<td>09/10</td>
<td>114350</td>
<td>114350</td>
</tr>
<tr>
<td>10/11</td>
<td>145000</td>
<td>145000</td>
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<tr>
<td>11/12</td>
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<td>241807</td>
<td>241807</td>
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<td>13/14</td>
<td>251075</td>
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</tr>
<tr>
<td>14/15</td>
<td>54203</td>
<td>54203</td>
</tr>
<tr>
<td>15/16</td>
<td>295920</td>
<td>295920</td>
</tr>
</tbody>
</table>

4,800 Gallon Liquid Deice Truck with 75’ Wide Spray Boom
Liquid Deicers
Snow and Ice Removal Equipment

- Solid Deice Chemicals
  - NAAC, NAAF, Ice Care
    - Effective to 0°F

- Sand

### SLC solid chemical and Sand Usage

<table>
<thead>
<tr>
<th></th>
<th>09/10</th>
<th>10/11</th>
<th>11/12</th>
<th>12/13</th>
<th>13/14</th>
<th>14/15</th>
<th>15/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Chemical (Tons)</td>
<td>431</td>
<td>765</td>
<td>669</td>
<td>1263</td>
<td>471</td>
<td>96</td>
<td>384</td>
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<tr>
<td>Sand (Tons)</td>
<td>470</td>
<td>1192</td>
<td>377</td>
<td>1210</td>
<td>535</td>
<td>69</td>
<td>268</td>
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<tr>
<td>Snowfall (Inches)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>500</td>
<td>40</td>
<td>80</td>
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</tbody>
</table>

12 Yard Sand and Solid Deice Trucks with 50’ Spreader
Landside Snow Removal Management

- Joint Effort Between Airport Maintenance & Contracted Teams
  - 55 Miles of Public Roadways
  - Parking Lots and Sidewalks

SLC Road Salt & Ice Melt Usage

<table>
<thead>
<tr>
<th>Date</th>
<th>Salt (Tons)</th>
<th>Ice-Melt (Bags)</th>
<th>Snowfall (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/10</td>
<td>1950</td>
<td>956</td>
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<tr>
<td>10/11</td>
<td>3345</td>
<td>1648</td>
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<tr>
<td>11/12</td>
<td>761</td>
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<td>2971</td>
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<td>2446</td>
<td>1167</td>
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<tr>
<td>14/15</td>
<td>394</td>
<td>140</td>
<td>-</td>
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<tr>
<td>15/16</td>
<td>1625</td>
<td>716</td>
<td>-</td>
</tr>
</tbody>
</table>
Results

Minimal Shutdowns During Winter Months

All Runways Closed

Inches

Time (H:MM)


Snowfall (Inches)

All Runways Closed (H:MM)  

0:16 1:38 0:00 6:25 3:58 0:00 0:40

0:16 0:18 1:20 0:00 1:30 0:14 3:15 1:05 0:21 0:19 0:31 0:05 0:08 0:11 2:15 0:31 0:00 0:25 0:15
SLCDA Chemical Storage Building
## Results

**SLC Ranks High for On-Time Arrivals & Departures**

<table>
<thead>
<tr>
<th>Year</th>
<th>On-Time Arrival Rank</th>
<th>On-Time Departure Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td># 1 - 83.51%</td>
<td># 1 - 86.41%</td>
</tr>
<tr>
<td>2009</td>
<td># 1 - 85.10%</td>
<td># 2 - 87.86%</td>
</tr>
<tr>
<td>2010</td>
<td># 6 - 82.68%</td>
<td># 3 - 84.94%</td>
</tr>
<tr>
<td>2011</td>
<td># 1 - 86.36%</td>
<td># 2 - 87.80%</td>
</tr>
<tr>
<td>2012</td>
<td># 1 - 88.55%</td>
<td># 1 - 89.83%</td>
</tr>
<tr>
<td>2013</td>
<td># 1 - 85.04%</td>
<td># 1 - 86.69%</td>
</tr>
<tr>
<td>2014</td>
<td># 1 - 85.57%</td>
<td># 1 - 86.72%</td>
</tr>
<tr>
<td>2015 Jan-Nov</td>
<td># 1 - 87.62%</td>
<td># 1 - 87.85%</td>
</tr>
</tbody>
</table>

**SOURCE:** Bureau of Transportation Statistics, Airline On-Time Data
Lessons Learned

• Closer coordination between operations and maintenance
• Working closer with factory technical support
• Provide additional training
• Make sure to use all tools available
• Contract negotiation
• Attend trade shows, conferences
• Increase storage capacity
• Materials diversification (with in reason)
• Networking..... Networking!
Results

Safety, Safety, Safety………… Safety!

Jackson Hole, WY
12/29/10

Cherry Capital Airport, MI
4/12/07

Youngstown, OH
1/3/12

Chicago Midway, IL
12/8/05
Questions?