Automated Shipping Container Transfer System Design

I-PRO 307
Fall 2005
# Team Members

<table>
<thead>
<tr>
<th>Project Aspect</th>
<th>Task Leader</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Leader</td>
<td>Paul Prusa</td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td>Thruport</td>
<td>Christopher Tyson</td>
<td>Physics</td>
</tr>
<tr>
<td>Volume Mapping</td>
<td>Patrick Folz</td>
<td>Aerospace Engineering</td>
</tr>
<tr>
<td>Website</td>
<td>Brian Neiswander</td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td>Fresh Site Evaluation</td>
<td>Alija Hubjer</td>
<td>Architecture</td>
</tr>
<tr>
<td>Brown Field Evaluation</td>
<td>Joshua Vogt</td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td>Recycled Site Evaluation</td>
<td>Douglas Meyer</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Animations</td>
<td>Alan “Hugh” Whitmore</td>
<td>Architecture</td>
</tr>
<tr>
<td>Environmental Evaluation</td>
<td>Purvi Patel</td>
<td>Computer Science</td>
</tr>
</tbody>
</table>

**Advisors**

- Laurence Rohter, IIT
- Ariel Iris, Chicago Area Transportation Study
- Peter Mirabella, MiJack Products
- Gerald Rawling, Chicago Area Transportation Study
Background

- Chicago is third largest intermodal shipping container hub in the world.
- Approximately 2000 rubber tire transfers take place in Chicago each day, burning roughly 15,000 gallons of fuel a day. These transfers congest the roads and highways, pollute the environment, and burn significant amounts of fuel.
- There are six major companies that deal with the intermodal traffic in the Chicagoland area; BNSF, UP, CN, NS, CP, and CSX.
- These companies run approximately 20 rail yards in the area.
Abstract

The project was separated into 8 different tasks

- **Thruport**- Understand and evaluate the Thruport concept and the gantry cranes
- **Animations**- Modify existing gantry crane animations and create a real time walk through animation
- **Volume Mapping**- Present volume data and rail road connections in a map
- **Fresh Site Evaluation**- Evaluate a previously undeveloped site for Thruport
- **Brownfield Site Evaluation**- Evaluate a polluted site that previously had industrial activity for Thruport
- **Recycled Site Evaluation**- Evaluate a site that previously operated as a rail yard for Thruport
- **Environmental Evaluation**- Determine environmental concerns for evaluated sites and surrounding area
- **Website Development**- Organize and manage the creation and maintenance of the web site
The Thruport concept is a rail yard operated by computer controlled gantry cranes for intermodal container transfer between the major rail road companies.
Thruport’s Unique Features

There are three main attributes that make Thruport unique.

- Thruport uses conventional technology that allows the cost of the hardware to remain low.
- The operating scheme relies on the cooperation of the major rail companies. The trains come to a central facility to exchange containers, like an airport hub.
- Thruport strives on location. Thruport requires a good location to fully optimize the solution for both the customer and the owner.
Cost Evaluation of Thruport

- 200 employees to run Thruport
  - 30 Materials Handling Supervisor: $52000 per employee
  - 70 Materials Handling III: $41000 per employee
  - 10 Inventory Control Manager: $78000 per employee
  - 20 Logistics Analyst IV: $82000 per employee
  - 10 Electronics Technician III: $57000 per employee
  - 20 General Maintenance: $45000 per employee
  - 10 Maintenance Supervisor: $63000 per employee
  - 10 Engineer III: $77000 per employee
  - 20 Field Service III - Rep Electro/Mechanical: $54000 per employee

- $11,000,000 annual payroll estimate
- $100,000,000 for the four cranes in Thruport
- At $100 per transfer doing 2,000 transfer per day it will take approximately two years to get a return on the investment
Volume Mapping

- Volume mapping is necessary in deciding the location of possible sites to know the location of high volumes of traffic.
- Volume data can be used to predict the travel routes of intermodal containers to the potential Thruport site.
- The areas zoning classifications can be easily viewed and recorded using a map.
Intermodal Exchanges Diverted to Wisconsin Steel Pat Folz ipro307
A fresh site is a site that previously was undeveloped.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>The site requires no clean up or major rehabilitation</td>
<td>Long travel distances from intermodal hubs</td>
</tr>
<tr>
<td>Zoning is often not an issue because undeveloped land is located in rural areas</td>
<td>High costs to make the site accessible to all the major lines</td>
</tr>
<tr>
<td>Land cost are relatively cheap in comparison to city property</td>
<td>High cost to bring utilities to the site</td>
</tr>
<tr>
<td>Large land area is available</td>
<td></td>
</tr>
</tbody>
</table>
Rochelle Site (fresh site)

Thruport concept

Rochelle UP Rail Yard

Site Dimensions: Length: 2 mile  Width: ½ -1 mile
Area Zoning: None
Rail Access: Located on Union Pacific main line
A brownfield site is a polluted site that was previously an industrial site.

**Advantages**
- Accessible from main rail lines
- New developers of the site will not incur the cost of recycling the site
- Accessible to utilities

**Disadvantages**
- Possible zoning issues
- Long time to make the site clean and usable
- High land cost for city property
- Large amounts of land capable of containing Thruport may be unavailable
Wisconsin Steel Site (brownfield site)

Site Dimensions: Length: 1 mile  Width: 0.27-½ mile
Area Zoning: Planned Manufacturing District
Rail Access: Existing track on site
Nearest mainline track: 1.5 miles NE
Recycled Site

A recycled site is a site that was previously a rail yard.

**Advantages**
- Accessible from main rail lines
- No zoning issues
- Large land dimensions for Thruport
- Accessible to utilities

**Disadvantages**
- High land cost for city property
- Mild cost to rebuild site
The environmental concerns that were considered important in evaluating a site for the Thruport concept are as follows:

- Noise
- Wetland location
- Air quality
- Height restrictions

These are not as restrictive where the land has already been zoned for industrial or railroad use.
## Three Site Evaluation

<table>
<thead>
<tr>
<th>Title</th>
<th>Description</th>
<th>Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Rochelle (Fresh)</td>
</tr>
<tr>
<td><strong>Land</strong></td>
<td>Cost of actual land</td>
<td>$$</td>
</tr>
<tr>
<td><strong>Rail Access</strong></td>
<td>Cost to bring rail from a main service line to site; repairing or upgrading</td>
<td>$$$</td>
</tr>
<tr>
<td></td>
<td>existing rail to site</td>
<td></td>
</tr>
<tr>
<td><strong>Site Preparation</strong></td>
<td>Cost for any site cleanup, existing structures demolition, dirt work</td>
<td>$</td>
</tr>
<tr>
<td><strong>Utilities</strong></td>
<td>Cost to bring utilities such as water and electricity to the site</td>
<td>$$</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>8x$</td>
</tr>
</tbody>
</table>
Project Website

- Simple menu system for easy navigation
- No frames, white background, small text
- Consistent color scheme
- Flash animation intro

http://www.iit.edu/~ipro307f05
Website Flow Chart

WWW

FLASH ANIMATION

HOME

PROJECT

- Project Info
- Thruport
- Sites
- Deliverables
  - Project Plan
  - Midterm Reports
  - IPRO Day
  - Final Reports

TEAM

- History
  - Goals
  - Future
- Team Members
- Team Tasks
- Important Events

RESOURCES

- Photos
- Downloads
- Links
- Google Earth Links
- Search
- Contact

- Wisconsin Steel
- Indiana Site
- Rochelle Site
- About Thruport
- Specifications
- 3D Model

http://www.iit.edu/~ipro307f05
Next Semester’s Plan

- Create a more in depth site comparison criteria
- Find land cost for site comparison
- Do further evaluation of the recycled site in Indiana
- Do an expandability evaluation of rail yards for Thruport
- National operating and refined regional plan
Thank you to our sponsors
Jack Lanigan Sr. and Peter Mirabella of Mi-Jack Products

Questions?