Review of a Successful Propane Vapor Distribution System

An industry overview of propane gas pipeline facility design and construction

August 2017
PSC Overview

- Established 1960
- Headquartered in Dallas, TX & Publically traded on Nasdaq (PRIM)
- $2.1 B Revenue
- $2.8 B Backlog
- Ranked 35th by ENR Among “Top 400 General Contractors in 2017”
- Ranked 44th on Fortune’s “Fastest Growing Companies”
- 9,000+ employees
- Company-owned equipment fleet of over 8,000 pieces
- Over 150,000 square feet of fabrication facilities
- Continuing Safety Improvements
- Full Engineer-Procure-Construct capabilities
- Selected by Forbes in 2015 as one of “The 100 Most Trustworthy Companies in America”
THREE PRIMARY METHODS OF INSTALLING GAS DISTRIBUTION PIPING

1. TRENCHING
   - MACHINE (Backhoe, Mini Excavator, Trencher)
   - HAND

2. HORIZONTAL DIRECTIONAL DRILLING

3. USE OF PNEUMATIC PIERCING TOOL
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OTHER METHODS OF INSTALLING GAS DISTRIBUTION PIPING

- PIPE BURSTING
- PIPE SPLITTING
- AUGER CASING
- SLICK BORES
Gas Distribution Installation

FACTORS DETERMINING MEANS AND METHODS

Subsurface Conditions

Existing Utilities

Existing Soil Conditions

Soil Report Differences

Bore Log Differences

Subsurface Conditions

Existing Utilities

Assumptions for Unknown Substructures?

Abandoned Utilities

Ground Water

Discharge Options

Testing Requirements

Well Point Responsibility

Rock

Blasting

Hoe Ram

Chemical

Footage Excavation

Footage Pipe Lay

Footage Pipe in Ground

Footage Backfilled Production per Day

Pavement Restoration

Asphalt Replacement

Replace with Existing

Core Samples to Determine Depth

Within Excavation

Outside Excavation – Square Foot Price

Concrete Sub-base Thickness

CTB Sub-base Thickness

Jobsite Restrictions

Work Hour Restrictions

Traffic Flow Restrictions

Parking Restrictions for Employees and Public

Posting of No Parking / Towing

Noise Restrictions

Staking Responsibilities

Centerline

Re-Staking

Restoration of Worksite

Site Specific Work Plans

Extra Work Space

Yard Space

Dust Control – Water Cost and Availability

Artifacts

Labor, Equipment and Material Rates to be Charged at Current Rates at Time of Construction

Empirical Calculations

Financial Considerations

Construction

Public

Discharge Options

Parking

Street Sweeping Requirements Specified

Wash Station for Vehicles Going onto Streets from Public Right of Way

Spoil Stockpile of Off-Haul

Permit for Stockpile Site

Landowner Agreement

Analytical Cost to Determine Dump Location

Contaminated Soil Contingencies

Import Soil Assumptions i.e. 100% or less

Parking

Employee Vehicles

Water

Water Supply

Discharge Points

Contaminated Soil Testing

Who Provides Water

Cost of Water

Discharge Points

Compaction Testing Requirements

Method

Who Provides Curve

Cost of Testing / Frequency

Locations

Contaminated Soil Costs

Environmental – EPA Mitigation

Erosion Control

Hydroseed

Geo Fabric

Straw

Silt Fence

Safety Requirements

Governing Agency

Special Rules and Regulations
BEST MANAGEMENT PRACTICES

• ENVIRONMENTAL
  • Site Specific Requirements
  • Site Specific Employee Training
  • Stormwater Management (SWPPP)
  • Good Housekeeping
  • Equipment Emissions
  • Material Safety Data Sheets (MSDS)
    ✓ Widely used system for catalog information on chemicals
    ✓ Instructions for safe use and potential hazards
    ✓ Focus on hazards of working with the material
    ✓ Specific to Country and supplier of product

• UNDERGROUND SAFETY AND DAMAGE PREVENTION
  • 811 Call System for Utility Marking (State Programs)
    http://commongroundalliance.com/
  • Horizontal Directional Drilling Best Practices
Gas Distribution Installation

SAFETY

- Establish Site-Specific Safety Plan prior to job start
- Hold morning Tail Gate Meeting communicating the expectation for the day
- Conduct Job Safety Analysis (JHA) to communicate in writing the steps, hazards, and mitigations to reduce risk while performing work activities
- Behavioral Based Safety Observation Program captures both safe and at risk behaviors from the crafts eyes. This information is tracked and trended to give ARB best opportunities to stop injury occurrences
- Stop Work Authority (SWA) safety culture compliments the safe guards giving personnel the best chance to go home in the same condition they came to work

“No business objective is so important that it will be pursued at the sacrifice of safety”
CONSTRUCTION PERSONNEL TRAINING

- OPERATOR QUALIFICATIONS
  - Veriforce / NCCER

- FUSION AND WELDING CERTIFICATIONS
  - PE Tapping / Butt, Socket and Saddle Fusion
  - Welding of Metal Pipe

- GOLD SHOVEL STANDARD
MAMMOTH LAKES, CA DEMOGRAPHIC OVERVIEW

APPROXIMATE POPULATION OF 8,300 (2010 Census)

MOUNTAIN RESORT TOWN (Summer and Winter)

ELEVATION 7,800 FEET in the Eastern Slope of the Sierra Nevadas

POPULATION INCREASE ON WEEKENDS AND HOLIDAYS

GEOLOGICALLY ACTIVE (Long Valley Caldera, Hot Springs and Lava Domes)

Access Area To:

• Yosemite National Park
• Death Valley
• Mt. Whitney
• Ansel Adams Wilderness
• Devils Postpile National Monument
• Skiing & Snowboarding
• Hiking, Biking, Sightseeing
In 1999 ARB’s (a Primoris Company) affiliated company (Rock Creek Energy) entered into a propane infrastructure agreement to supply a large new ski resort development (3 hotels, 5 condo’s, 60 homes).

Construction began to allow supply from one central storage tank to supply first construction projects.

In 2001 executed a franchise agreement to allow supply to other and existing homes and businesses in Mammoth Lakes, CA.

System was envisioned to start with propane and convert the system to LNG supplied methane.

From 1999 through 2007 built 12 miles of main (4 in SDR 11) pipeline and connected over 40 businesses and 200 home meters to the system.

Entire propane demand was supplied from 3 preexisting 30,000 gallon bullet tanks. – but did have to install vaporizers.
Mammoth Lakes Propane Vapor System

- Cost of system was approximately $3.5 million.
  - Alternative (individual tanks) cost would have been approximately $1.5 million.
- Peak winter demand of 900 gallons per hour – 786,000 standard cubic feet per day (786 “Mscfd”)
  - Peak 12,500 gallons per day – 455 Mscfd
  - Average Winter Demand – 200,000 gallons per month 242 Mscfd.
- Annual demand of 1.2 millions gallons – 120 Mscfd
- The difference between Peak Demand and Average Demand (design factor of 6.8) must be accounted for by the design of the pipeline and appurtenant equipment.
- However, the lower cost (tank supplied) systems have to have enough personnel to meet peak winter time demands
  - Delivery of propane by bobtails,
  - Digging out tanks from feet of snow,
  - Relights due to propane tanks running out with absent homeowners and competing immediate demands.
  - During winter need one bobtail and 3 personnel for each 6,000 gallons per day.
- Average fee for individual tank delivery is $0.80 per gallon – escalates with inflation.
- Delivery through the Mammoth Lakes distribution system was $0.55 per gallon – escalates at 1/3 inflation.
Controlling Construction cost ... 
ARB’s Expertise was key
System Design Controlling Capital Costs

System Design

• Peak delivery of 800 Mscfd would require 6” pipeline.
  ➢ Familiarity with cost of construction lead to two 4” common trench lines versus 6”.
    ➢ Gave greater flexibility in operations
    ➢ Better insurance of delivery
    ➢ Allowed for future transition to natural gas.
    ➢ Extra peaking supplied by connecting to a tank at the “far” end.
      ▪ Two way gas measurement.
      ▪ Reduced deliveries to hard to reach bullet to twice a year versus once a month during peak season.

• Road construction and need for high compaction but limited construction window.
  ➢ Heavy use of 2 sack slurry in the roads yielded lower construction cost.
    ➢ Met all compaction requirements.
    ➢ Quicker construction allowed more productivity in seasonal construction window.
• Local Fire Department
  
  ➢ Demanded a mainline valve every 10 feet.
  ➢ For 4 years we were able to work with but still installed over 20 valves.
    ▪ Retirement lead to later personnel demanding more valves.
    ▪ Construction to the rest of the town was suspended.
    ▪ Project was ultimately sold to AmeriGas and construction has since be curtailed due to the “valve” issue.
  
  ➢ Meter installations were a considerable cost.
    ▪ Schedule 80 steel pipe.
    ▪ Meter protection regardless of where it was located.
Design, Construction, and Operation Impediments

- Gas Measurement CA Department of Agriculture
  - Propane Measurement is governed by rules established in early 1950’s by NIST Handbook 44.
  - Billing must be in as measured cubic feet – the customer only wants to know gallons.
  - A 2% meter error results due to specified atmospheric base pressures.
  - Propane is not an “ideal gas” and most propane supplies are not failure with American Gas Association measurement standards.
  - Without proper adjustment 5% total gallon measurements are not uncommon.

<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>Altitude Correction Factor</th>
<th>Assumed Atmospheric Pressure</th>
<th>Assumed Atmospheric Pressure Plus Gauge Pressure</th>
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<td></td>
<td>11 inch WC</td>
<td>7 inch WC</td>
<td>11 inch WC (psia)</td>
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<td>above -150 to 400</td>
<td>1.02</td>
<td>1.01</td>
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<td>above 400 to 950</td>
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<td>above 14010 to 14950</td>
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</table>
But there are benefits

- Environmental aesthetics – nobody wants a propane tank in the middle of their view.

- Lower truck traffic.
  - 5000 miles per year of bob-tail truck deliveries are avoided.
  - Approximately 3000 home deliveries.

- Lower Delivered cost of to the consumers.
  - But the Mammoth Lakes system was almost “new build”.

- Much higher security off delivery especially during extreme winter weather – when it’s most needed.
  - “We couldn’t have supplied the town without the propane distribution system.”

- Safety – I don’t care what the fire department says.
Primoris:
An Established Infrastructure Company

Why We’re Unique:
A Conservative Culture Paired with Entrepreneurial Spirit

How We Are Growing:
Best-in-Class Within Diverse End Markets

Thanks for your time!