Cost Reduction

Dan Gallagher
Gallagher Asphalt Corp.
Thornton, Illinois
Agenda

• Drying Aggregate
• Heating stored asphalt cement
• Electrical Power
• Trucking
• NAPA as your resource
• Questions?
Energy Cost have gone up
Time to re-evaluate payback

Those over 400Kw could
See a 30% increase in price!
How can we reduce our drying cost?
Here are a few ideas

• Reduce Aggregate Moisture
• Insulating Dryer Shell / surface
• Reduce Exit Gas Temperature
  – Replace worn flights
• Reduce Mix Temperature
• Use Alternate Fuels
1% change in composite moisture in the aggregate will reduce your BTU or fuel requirements by 10%

How can we reduce the moisture in our stock piles?

NAPA pub-IS52
The Drying Process

MOISTURE REMOVAL

HEATING AGGREGATE
| MOISTURE | 7%    | 1.12 gal. / ton | 0.83 gal. / ton |
|----------|-------|-----------------|-----------------
|          | 6%    | 0.96 gal. / ton | 0.83 gal. / ton |
|          | 5%    | 0.80 gal. / ton | 0.83 gal. / ton |
|          | 4%    | 0.64 gal. / ton | 0.83 gal. / ton |
Production — 400 Tph..... 10 hours = 4,000 Tpd

Moisture — 7%......28 Tph water = 56,000 lb. = 6,747 gal. / hr. = 67,470 gal. / day or 11.25 Transport Loads / Day

Moisture — 6%......24 Tph water = 48,000 lb. = 5,783 gal. / hr. = 57,830 gal. / day or 9.64 Transport Loads / Day

Moisture — 5%......20 Tph water = 40,000 lb. = 4,819 gal. / hr. = 48,190 gal. / day or 8.03 Transport Loads / Day

Moisture — 4%......16 Tph water = 32,000 lb. = 3,855 gal. / hr. = 38,550 gal. / day or 6.42 Transport Loads / Day

Fig. 6A  WATER EVAPORATION REQUIRED
Material sinks into the ground under unpaved stockpiles.
Unsloped stockpiles hold water
Stockpiles with ideal 6 percent slope
CORRECT

STOCKPILE

COLD FEED BIN

50 feet

6°

10'
With just 1% reduction in moisture

- Cost of Paving – 60,000 ft.², 6” thick = $36.00 / ton
  2,000 tons x $36.00 = $72,000.00

- Based on 200,000 tons / year; $2.40 /ton fuel cost
  10% Fuel Savings = $0.24 /ton

  200,000 tons x $0.24 / ton = $48,000.00 per year

- ROI ≤ 18 months
### Percent of Moisture Removed and Gallons of Fuel per Ton

<table>
<thead>
<tr>
<th>DRUM DIAMETER</th>
<th>PROCESS GASES THRU DRUM</th>
<th>3%</th>
<th>4%</th>
<th>5%</th>
<th>6%</th>
<th>7%</th>
<th>8%</th>
<th>9%</th>
<th>10%</th>
<th>11%</th>
<th>12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'</td>
<td>27,315</td>
<td>262</td>
<td>219</td>
<td>188</td>
<td>164</td>
<td>145</td>
<td>130</td>
<td>117</td>
<td>107</td>
<td>97</td>
<td>90</td>
</tr>
<tr>
<td>7'</td>
<td>40,911</td>
<td>392</td>
<td>328</td>
<td>281</td>
<td>245</td>
<td>217</td>
<td>194</td>
<td>175</td>
<td>159</td>
<td>146</td>
<td>134</td>
</tr>
<tr>
<td>8'</td>
<td>54,751</td>
<td>525</td>
<td>439</td>
<td>376</td>
<td>328</td>
<td>291</td>
<td>260</td>
<td>235</td>
<td>213</td>
<td>195</td>
<td>180</td>
</tr>
<tr>
<td>9'</td>
<td>68,286</td>
<td>655</td>
<td>548</td>
<td>469</td>
<td>409</td>
<td>362</td>
<td>324</td>
<td>292</td>
<td>266</td>
<td>244</td>
<td>224</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>319</td>
<td>292</td>
<td>268</td>
<td>91,737</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Increase in production of 86 TPH**

- Process Temperatures: 240F Stack, 300F Mix, 5% AC
- Drum Process Oxygen = 9% (well-tuned burner)

Fuel: No. 2 Diesel with LHV of 132300 Btu/gal

Actual tonnage rates may be limited by mixing capacity, actual fuel heating values and/or maximum burner output.

**Production rates of Counter Flow Drum Mixers (Imbedded Burner) including liquid asphalt**
Which one of these things is not like the others?
Reduce Shell Loss with Insulation

• The NAPA IS-52 report states that insulating the dryer shell can save 10%

• Most new dryers now come insulated

• $480,000 \times 5\% = \$24,000$

• Talk to after market suppliers
Reduce Exit Gas Temperature

- A 40°F reduction in exit gas can save 4%
- Replace worn flights
- Check the temperature across the back
- Don’t go too low… Minimum of 240°F
USING WELL DESIGNED FLIGHTS AND KEEPING THEM IN GOOD CONDITION CAN SAVE A LOT OF MONEY.

HEAT ESCAPES THROUGH HOLES IN THE VEIL.

WORN FLIGHTS

GOOD FLIGHTS
BURNED PAINT ON ONE SIDE OF BREECHING INDICATES EXTREME HEAT LOSS.
TEMPERATURES ACROSS THE INTAKE BREECHING SHOULD BE CONSTANT.
BETTER FLIGHTS SAVE FUEL
BY CONTROLLING STACK TEMP.

EXAMPLE: DECREASE STACK TEMPERATURE FROM
300 F TO 240 F

ASSUME: 200,000 TON ANNUAL PRODUCTION
FUEL COST $2.40/ton

SAVINGS = $2.40 x 200,000 TON x (4% Savings) =
$19,200/YR

08/01/2006
OVER HEATED MIX WASTES FUEL, REDUCES CAPACITY, AND INCREASES EMISSIONS.

- 2-3% savings for every 10°F final mix temperature
### Combined Fuel Saved Due to Stack Temperature and Mix Temperature Reductions

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stack Temp. Reduction</td>
<td>$19,200</td>
</tr>
<tr>
<td>Mix Temperature Reduction</td>
<td>$12,000</td>
</tr>
<tr>
<td><strong>Total Fuel Savings</strong></td>
<td><strong>$31,200</strong></td>
</tr>
</tbody>
</table>
LOWERING STACK TEMPERATURE INCREASES EFFECTIVE CAPACITY TOO.

EFFECT OF EXHAUST TEMPERATURE ON PRODUCTION
REDUCING EXCESS AND LEAKAGE AIR SAVES FUEL AND INCREASES EFFECTIVE CAPACITY.
SOURCES OF UNNEEDED AIR

- Burner Excess Air
- Drum Seals
- Flopgates (100 TPH)
- Unsealed Duct Joints
- Loose Doors
- Missing Gaskets
- Airlocks
EXHAUST FAN

- VFD
- Dual vs. Single motor
- Dampers functional & controlled
- Impeller clean and balanced
- Backward Incline Fan
- Power Monitoring
Using Alternate Fuels

- Natural Gas
- Propane
- No. 2 diesel Fuel
- No. 5 oil
- Reclaimed oil or Re-fined oil (RFO)
- Coal

Clean and easy to burn

Maybe cheaper with some challenges

Less then No.2

Very cheap..takes work/equipment - emissions

Which one is best?
It's all about the BTU's

MOISTURE REMOVAL

HEATING AGGREGATE

The Drying Process
## Equivalent Energy Costs

<table>
<thead>
<tr>
<th>Type of Energy</th>
<th>Heating Value (Net or LHV)</th>
<th>Billing Units</th>
<th>Cost Comparisons Based On Heating Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO. 2 FUEL OIL</td>
<td>Btu/gal 132,000</td>
<td>Per Gallon</td>
<td>$0.80 $0.90 $1.00 $1.10 $1.20 $1.30 $1.40 $1.50 $1.60 $1.70 $1.80 $1.90 $2.00 $2.10 $2.20 $2.30 $2.40 $2.50</td>
</tr>
<tr>
<td>NO. 5 FUEL OIL</td>
<td>Btu/gal 143,250</td>
<td>Per Gallon</td>
<td>$0.87 $0.98 $1.09 $1.19 $1.30 $1.41 $1.52 $1.63 $1.74 $1.84 $1.95 $2.06 $2.17 $2.28 $2.39 $2.50 $2.60 $2.71</td>
</tr>
<tr>
<td>PROPANE (LPG)</td>
<td>Btu/gal 84,345</td>
<td>Per Gallon</td>
<td>$0.61 $0.68 $0.76 $0.83 $0.91 $0.98 $1.06 $1.14 $1.21 $1.29 $1.36 $1.44 $1.52 $1.59 $1.67 $1.74 $1.82 $1.89</td>
</tr>
<tr>
<td>NATURAL GAS</td>
<td>Btu/CCF (see note*)</td>
<td>Per CCF</td>
<td>$0.55 $0.62 $0.69 $0.75 $0.82 $0.89 $0.96 $1.03 $1.10 $1.17 $1.23 $1.30 $1.37 $1.44 $1.51 $1.56 $1.65 $1.71</td>
</tr>
<tr>
<td></td>
<td>Btu/Therm 100,000</td>
<td>Per Therm</td>
<td>$0.61 $0.68 $0.76 $0.83 $0.91 $0.98 $1.06 $1.14 $1.21 $1.29 $1.36 $1.44 $1.52 $1.59 $1.67 $1.74 $1.82 $1.89</td>
</tr>
<tr>
<td>ELECTRICITY</td>
<td>Btu/Kwh 3,413</td>
<td>Per Kwh</td>
<td>$0.02 $0.02 $0.03 $0.03 $0.03 $0.03 $0.04 $0.04 $0.04 $0.04 $0.05 $0.05 $0.05 $0.05 $0.06 $0.06 $0.06 $0.06</td>
</tr>
<tr>
<td>COAL</td>
<td>Btu/pound 12,000</td>
<td>Per Ton</td>
<td>$145 $164 $182 $200 $218 $236 $255 $273 $291 $309 $327 $345 $364 $382 $400 $418 $436 $455</td>
</tr>
</tbody>
</table>

Each column of cost comparisons relates the costs of various types of energy to each other based on heating values.

For example, the cost of No. 2 fuel oil at $1.00 per gallon is equivalent to a cost of $1.09 for No. 5 fuel oil for the same Btu. Thus, if No. 2 fuel oil is $1.00 per gallon it doesn’t pay to choose No. 5 fuel oil unless it is less than $1.09.

Likewise, it wouldn’t pay to use electricity unless it is less than $0.03 per Kwh when No. 2 fuel oil is $1.00 per gallon.

The actual heating values of various fuels vary somewhat from one region to another. However, the values used here are for fuels commonly used in the U.S.

CCF stands for 100 cubic feet. The net heating value of one cubic foot of natural gas is 905 Btu. *However, natural gas is normally billed at its gross heating value, which is approximately 1,000 Btu per cubic foot.

Suppliers may show prices for natural gas as $ per MMBtu (dollars per million Btu). If so, divide the price by 10 to obtain the price Per Therm.

You can download this from Astec
ON THE BASIS OF HEAT PROVIDED PER DOLLAR, THESE ARE ALL EQUAL VALUES:

1. WASTE OIL AT $1.00/GAL *
2. NO. 2 OIL AT $0.98/GAL
3. NATURAL GAS AT $0.74/THERM

* WASTE OIL CONTAINING 5% WATER.
RECYCLED OIL:

IS GENERALLY LESS EXPENSIVE THAN NO. 2 OIL BUT IS BECOMING INCREASINGLY SCARCE WHILE QUALITY STEADILY DIMINISHES.

MAKE SURE YOU CONSIDER THE HIDDEN COSTS.

EXPEND THE EXTRA EFFORT TO DO IT RIGHT.
SUBTRACT THE WATER

5% WATER IN THE FUEL AMOUNTS TO A DECREASE IN HEATING VALUE OF ABOUT 7,500 BTU PER GALLON.

FUEL OIL HHV  142,000 BTU/GAL
WATER LOSS  7,500 BTU/GAL
USABLE HEAT  134,500 BTU/GAL
KEYS TO BURNING RECYCLED OIL

• KEEP OIL CLEAN COMING IN
• KEEP BURNER CLEAN AND IN GOOD CONDITION
• VISCOSITY
  – 80 SSU or less
    • Must be preheated for good atomization.
    • Preheating is easier if oil is “pushed” through the preheater.
    • Vaporizing in the nozzle is minimized by using an air atomized nozzle.
• OIL PROPERTIES
  – Make sure the oil is free of destructive contaminants.
ATOMIZATION IS CRITICAL
MANY WASTE OIL BURNING PROBLEMS ARE RELATED TO POOR ATOMIZATION.
IMPROPERLY ATOMIZED OIL CAN FOUL THE WHOLE BURNERFRONT.
LARGE OIL DROPLETS WILL BE BLOWN INTO THE VEIL BEFORE THEY CAN BURN COMPLETELY.
POOR ATOMIZATION CAN LEAD TO A DISASTER.
POOR ATOMIZATION DESTROYS COMBUSTION ZONE FLIGHTS.
PROPERLY ATOMIZED FUEL HELPS PRODUCE A FLAME THAT IS SHORT AND SMALL IN DIAMETER LIKE THIS.
VISCOSITY AT THE BURNER IS WHAT MATTERS.

- CONTROL VISCOSITY, NOT OIL TEMPERATURE.
- AVOID LONG UNINSULATED FUEL LINES.
- KEEP FUEL HOSES UP OFF OF THE GROUND AND OUT OF THE MUD.
- RECIRCULATE BEFORE LIGHTING.
- HEAT IN-LINE (OK TO HEAT TANK TOO BUT NOT INSTEAD OF IN-LINE.)
Recycled oil cannot be burned effectively without proper preheating.
THIS WASTE OIL SYSTEM WORKS WELL EVEN WITH LONG PIPING RUNS BECAUSE THE PIPING IS WELL INSULATED.
WORN ATOMIZERS WASTE FUEL AND MONEY.

PINTLE EDGE WORN THIN

NEW PINTLE
USE SOCK FILTER AT UNLOADING POINT.
DUPLEX SCREENS JUST BEFORE PUMP
KEEP BURNER AIR AND OIL PASSAGES CLEAN.
KEEP EXCESS AIR LOW.
CHECK EXHAUST GASES WITH AN ANALYZER.
SEPARATED WASTE
OIL COMPONENT
MAKING ASH
BEWARE OF CORROSIVE CONTAMINANTS

THIS DAMAGE WAS CAUSED BY SULFURIC ACID RESIDUAL FROM A WASTE OIL TREATMENT PROCESS.
A SHORT FLAME IMPROVES DRYER THERMAL EFFICIENCY AND ENSURES NEAR 100% COMBUSTION EFFICIENCY.
ELEMENTS OF AN ENERGY SAVING STRATEGY FOR HMA PLANT DRYING OPERATIONS:

- FUEL CHOICE
- BURNER PERFORMANCE
- FLIGHTING SYSTEM PERFORMANCE
- MIX TEMPERATURE
- AIR IN THE SYSTEM
- HEAT LOSS
Efficient Asphalt Storage and Heating

Typical Heating And Storage For A Large HMA Plant
Efficient Asphalt Storage

Vertical & Horizontal Storage Tanks
Vertical Tank Advantages

- Small Footprint
- Secondary Containment
Vertical Tank Advantages

Excellent Mixing In Vertical Tanks
Vertical Tank Advantages

- Accurate Level Measurement
- Reduced Oxidation
Conserving Energy

Two Layers of 3” Thick Insulation
<table>
<thead>
<tr>
<th>Capacity (Gallons)</th>
<th>Btu Per Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Horizontal Tank No Insulation</td>
</tr>
<tr>
<td>10,000</td>
<td>633,850</td>
</tr>
<tr>
<td>15,000</td>
<td>791,621</td>
</tr>
<tr>
<td>20,000</td>
<td>1,006,753</td>
</tr>
<tr>
<td>25,000</td>
<td>1,221,886</td>
</tr>
<tr>
<td>30,000</td>
<td>1,437,018</td>
</tr>
<tr>
<td>35,000</td>
<td>1,562,050</td>
</tr>
<tr>
<td>40,000</td>
<td>1,786,536</td>
</tr>
</tbody>
</table>

* Btu values are for new Heatec tanks and do not include heat for valves or connections. Old tanks may require double the heat or more. Asphalt temperature = 300 degrees F.
Conserving Energy

30,000 Gallon Tank

46,992 BTU/hr − 25,660 BTU/hr = 21,332 BTU/hr saved

21,332 BTU/hr divided by .85 heater efficiency = 25,096 BTU/hr

25,096 BTU/hr divided by 132,000 BTU/gal = 0.19 gal/hr

0.19 gal/hr x 24 hrs/day x 260 days x$2.00/gal = $2,371/year

6” vs 3” Insulation Savings
Conserving Energy

Insulated Piping
Conserving Energy

Softpack Insulation
Heater Efficiency

Heatec Helical Oil Heater
### Calculating Heater Fuel Costs Per Hour

<table>
<thead>
<tr>
<th>HEATER EFFICIENCY</th>
<th>COST PER HOUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 PERCENT</td>
<td>1,000,000 Btu per hour × 1 × $2.00 = $30.30</td>
</tr>
<tr>
<td></td>
<td>132,000 Btu per gallon ÷ 0.50</td>
</tr>
<tr>
<td>60 PERCENT</td>
<td>1,000,000 Btu per hour × 1 × $2.00 = $25.25</td>
</tr>
<tr>
<td></td>
<td>132,000 Btu per gallon ÷ 0.60</td>
</tr>
<tr>
<td>70 PERCENT</td>
<td>1,000,000 Btu per hour × 1 × $2.00 = $21.65</td>
</tr>
<tr>
<td></td>
<td>132,000 Btu per gallon ÷ 0.70</td>
</tr>
<tr>
<td>80 PERCENT</td>
<td>1,000,000 Btu per hour × 1 × $2.00 = $18.94</td>
</tr>
<tr>
<td></td>
<td>132,000 Btu per gallon ÷ 0.80</td>
</tr>
<tr>
<td>85 PERCENT</td>
<td>1,000,000 Btu per hour × 1 × $2.00 = $17.83</td>
</tr>
<tr>
<td></td>
<td>132,000 Btu per gallon ÷ 0.85</td>
</tr>
</tbody>
</table>

Heating load = 1,000,000 Btu per hour. No. 2 fuel oil LHV (low heating value) = 132,000 Btu per gallon. No. 2 fuel oil cost = $2.00 per gallon.
Stack Temperature Vs. Heater Efficiency

Stack Temperature (degrees F)

Net Heater Efficiency (%)
Heater Efficiency

Stack Economizer
Economizer Test Data

Case Study:

- Heater Size – HCS 175
- Fuel - Diesel
- Exhaust Gas Inlet Temp. = 541 F
- Exhaust Gas Outlet Temp. = 395.9 F
- Thermal Oil Inlet Temp. = 279.9 F
- Thermal Oil Outlet Temp. = 281.9 F

- Efficiency Increase – 5%
Heater Efficiency

Stack Temperature Vs. Heater Efficiency

- Change Heat Transfer Oils
- Sample the Heat Transfer Oils
- Filter Heat Transfer Oils
- Burner Tune-Ups—Immediate Savings!!
- Eliminate Leaks – Oil is costly!!

Heater Maintenance
Conserving Energy

- Invested App. $12,000.00 in Stack Economizer, Burner Tune-Up, Pipe Insulation and Installation

- Fuel Usage Dropped From 6 GPH to 3.7 GPH Saving $4.60/hr

- Will Result In Yearly Savings of App. $40,000.00 or $0.27/ton

Case Study
Telephone Dialers

- Alerts plant personnel before tanks cool down
- Eliminates expensive down time before Monday morning backups
- If it works one time will pay for itself
Calibration Tanks

- Fast and trouble free meter calibration
- No tracking down distributor and driver
- Safety
- Accuracy
Automated Valves

- Automated Valves Are Air Operated
- Allows Control House Operation
- Visual Indicators Easy To Notice
- With The More Tanks /PG Grades Becomes More Practical
How many more slides does he have?
Reducing Trucking Costs
HMAT – Trucking Articles

• Balancing Production Rates in Hot Mix Operations

• Dump Truck Diligence: Keeping your Work Zone and Workers Safe

• Truck Management is Crucial to a Successful Paving Operation
Asphalt Production Cost Categories

- Material – 60% of Cost
- Plant Production – 11% of Cost
- Trucking – 15% of Cost
- Lay Down – 14% of Cost
Factors that Increase Trucking Costs

- Higher Fuel cost & Fuel Tax
- Higher Equipment cost
- Higher License fees
- Higher Insurance cost
- Regulations limiting Driver hours
- Higher Labor cost
- Less Skilled Drivers
- Congestion
- Delays in Trucking Cycle
Factors that Increase Trucking Costs

- Higher Fuel cost & Fuel Tax
- Higher Equipment cost
- Higher License fees
- Higher Insurance cost
- Regulations limiting Driver hours
- Higher Labor cost
- Lower Quality Drivers
- Congestion
- Delays in Trucking Cycle
Rising Cost Of Fuel

Diesel Fuel Prices

Cents/Gallon

Jan-00  Jul-00  Jan-01  Jul-01  Jan-02  Jul-02  Jan-03  Jul-03  Jan-04  Jul-04  Jan-05  Jul-05  Jan-06
Rising Cost Of Fuel

US 48 State Average Retail Price Per Gallon

January 2004  $ 1.55

January 2006  $ 2.46

59% Increase

- Control Excess Engine Idling
- Maintain Truck Engine Performance
- Insure Tire Pressure Levels - Lower Rolling Resistance
- Shorten Haul Cycles – Minimize Stop & Go’s
- Find Most Economical Haul Route in relation to Grade
Factors that Increase Trucking Costs

- Higher Fuel cost & Fuel Tax
- Higher Equipment cost
- Higher License fees
- Higher Insurance cost
- Regulations limiting Driver hours
- Higher Labor cost
- Less Skilled Drivers
- Congestion
- Delays in Trucking Cycle
OEM Truck Price Increases

2002 – 2006 U.S. Truck Manufacturers by Model Year

Paccar Corp. (Kenworth-Peterbilt) 19%

Volvo – Mack 17%

Freightliner 21%
Factors that Increase Trucking Costs

- Higher Fuel cost & Fuel Tax
- Higher Equipment cost
- Higher License fees
- Higher Insurance cost
- Regulations limiting Driver hours
- Higher Labor cost,
- Less Skilled Drivers
- Congestion
- Delays in Trucking Cycle
- Production: 240 tons per hour = 2,400 tons per day
- 20 Tons per Truck
- Truck Cost: $85 per hour = $1.42 per minute

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay at Plant</td>
<td>15 Min.</td>
</tr>
<tr>
<td>Loading Time</td>
<td>5 Min.</td>
</tr>
<tr>
<td>Ticket, Tarp, Sampling</td>
<td>5 Min.</td>
</tr>
<tr>
<td>Haul to Lay Down</td>
<td>20 Min.</td>
</tr>
<tr>
<td>Delay at Job</td>
<td>15 Min.</td>
</tr>
<tr>
<td>Truck Exchange</td>
<td>2 Min.</td>
</tr>
<tr>
<td>Dump</td>
<td>3 Min.</td>
</tr>
<tr>
<td>Return to Plant</td>
<td>20 Min.</td>
</tr>
<tr>
<td><strong>Total Cycle Time</strong></td>
<td>85 Min.</td>
</tr>
</tbody>
</table>

**Cost Cycle** $120.70

**Cost / Ton** $6.04

**Trucks Required** 17
• Production: 240 tons per hour = 2,400 tons per day
• 20 Tons per Truck
• Truck Cost: $85 per hour = $1.42 per minute

Delay at Plant: 15 Min.
Loading Time: 5 Min.
Ticket, Tarp, Sampling: 5 Min.
Haul to Lay Down: 20 Min.
Delay at Job: 15 Min.
Truck Exchange: 2 Min.
Dump: 3 Min.
Return to Plant: 20 Min.

Total Cycle Time: 85 Min.

Cost Cycle: $120.70
Cost / Ton: $ 6.04
Trucks Required: 17

Delay Time can be Improved To as Little 2 minutes
Delays at Plant

- Automatic spray system
Release Agent Application System
Locate Spray System in line with Plant
Delays at Plant

- Automatic spray system
- Bed liners
QuickSilver outlasts aluminum — and steel in many cases. QuickSilver is a specially formulated UHMW to achieve a super slick, tough surface. It handles hot asphalt up to 350°F. Its impact strength has been tested to -100°F without cracking or breaking.
Delays at Plant

- Automatic spray system
- Bed liners
- Stagger truck start time
Left Unmanaged; Trucks Start the Day in a Group and Stay in a Group
Production: 240 tons per hour = 2,400 tons per day
20 Tons per Truck
Truck Cost: $85 per hour = $1.42 per minute

- Delay at Plant 15 Min.
- Loading Time 5 Min.
- Ticket, Tarp, Sampling 5 Min.
- Haul to Lay Down 20 Min.
- Delay at Job 15 Min.
- Truck Exchange 2 Min.
- Dump 3 Min.
- Return to Plant 20 Min.

Total Cycle Time 85 Min.

Cost Cycle $120.7
Cost / Ton $6.04
Trucks Required 17

Loading Time can be Improved To as Little 2 minutes
• Poor Loading Time Is Directly related to how well Silos are managed
End The Day With Silos Full

- Less labor cost through out day

- Time to do maintenance on the plant in the afternoon

- 95% of all plant breakdowns occur at start-up in the morning
Well managed Silos eliminate long truck loading times throughout the day.
- Production: 240 tons per hour = 2,400 tons per day
- 20 Tons per Truck
- Truck Cost: $85 per hour = $1.42 per minute

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay at Plant</td>
<td>15 Min.</td>
</tr>
<tr>
<td>Loading Time</td>
<td>5 Min.</td>
</tr>
<tr>
<td>Ticket, Tarp, Sampling</td>
<td>5 Min.</td>
</tr>
<tr>
<td>Haul to Lay Down</td>
<td>20 Min.</td>
</tr>
<tr>
<td>Delay at Job</td>
<td>15 Min.</td>
</tr>
<tr>
<td>Truck Exchange</td>
<td>2 Min.</td>
</tr>
<tr>
<td>Dump</td>
<td>3 Min.</td>
</tr>
<tr>
<td>Return to Plant</td>
<td>20 Min.</td>
</tr>
<tr>
<td>Total Cycle Time</td>
<td>85 Min.</td>
</tr>
</tbody>
</table>

Ticket, Tarp, & Sampling Time can be Improved To as Little 2 minutes

<table>
<thead>
<tr>
<th>Cost Cycle</th>
<th>$120.70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost / Ton</td>
<td>$6.04</td>
</tr>
<tr>
<td>Trucks Required</td>
<td>17</td>
</tr>
</tbody>
</table>
Improving Ticket, Tarp, & Sampling

- Remote Ticket Printing System
Remote Printing is Faster than Conventional Vacuum Ticket Tube Delivery System
Crew: RED. Foreman: CM. CCode: 43000
GALLAGHER ASPHALT
18100 S. INDIANA AVE

THORNTON, IL 60476-
THE MEADOWS OF PEOTONE
4TH ADDITION
NORTH OF WILL./PEOTONE RD

MEADOWS OF PEOTONE

TRUCK: SHEPLEY 51094
MATERIAL: REGULAR BINDER

THORNTON. Printer C
TARE: 29860 LBS
GROSS: 71180 LBS
NET: 41320 LBS

LOAD NO. 2
ACCUM TOTAL: 42.11 Tons
30 TO GOVERNORS HWY, SOUTH TO WILL./PEOTONE RD.
(SOUTH OF TOWN AT STOP SIGN) WEST TO RATHJE RD.,
NORTH TO THE MEADOWS

Received by

Late payments subject to 1% monthly interest. Buyer shall also
pay all attorney and collection expenses.
Improving Ticket, Tarp, & Sampling

- Remote Ticket Printing System
- Automatic Tarping
Driver operates from the cab. No climbing or dangling off the truck. No out-of-control flying cranks to break hands or arms. No chain guard to block rear vision.

Help increase productivity because you can tarp and un-tarp while on the move.

Just turn a switch mounted inside the cab. Includes circuit breaker and indicator light.
Improving Ticket, Tarp, & Sampling

- Remote Ticket Printing System
- Automatic Tarping
- Automatic Sampling
Automatic Truck Sampling System
**Production:** 240 tons per hour = 2,400 tons per day

- **20 Tons per Truck**
- **Truck Cost:** $85 per hour = $1.42 per minute

### Time Breakdown

- **Delay at Plant:** 15 Min.
- **Loading Time:** 5 Min.
- **Ticket, Tarp, Sampling:** 5 Min.
- **Haul to Lay Down:** 20 Min.
- **Delay at Job:** 15 Min.
- **Truck Exchange:** 2 Min.
- **Dump:** 3 Min.
- **Return to Plant:** 20 Min.

**Total Cycle Time:** 85 Min.

**Cost Cycle:** $120.7

**Cost / Ton:** $6.04

**Trucks Required:** 17

---

**Haul to Lay Down & Return to Plant Time can be Improved 20%**
Better Management of Trucking

Make a interested person truck foreman to identify opportunities
- Best truck driver
- Young engineer

Supervisors Responsibilities
- Monitor & improve driver skills
- Ride frequently with drivers
- Define route for drivers before shift starts
- Teach technique on paving trucking
- Lowering the amount of over trucking
- Production: 240 tons per hour = 2,400 tons per day
- 20 Tons per Truck
- Truck Cost: $85 per hour = $1.42 per minute

- Delay at Plant 15 Min.
- Loading Time 5 Min.
- Ticket, Tarp, Sampling 5 Min.
- Haul to Lay Down 20 Min.
- Delay at Job 15 Min.
- Truck Exchange 2 Min.
- Dump 3 Min.
- Return to Plant 20 Min.

Total Cycle Time 85 Min.

Cost Cycle $120.70
Cost / Ton $6.04
Trucks Required 17

Delay At Job Time can be Improved To as Little 4 minutes
• Space Trucks to correlate with Coverage
• Do not Over Truck
Find ways to increase Double Hauling
- Production: 240 tons per hour = 2,400 tons per day
- 20 Tons per Truck
- Truck Cost: $85 per hour = $1.42 per minute

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay at Plant</td>
<td>15 Min.</td>
</tr>
<tr>
<td>Loading Time</td>
<td>5 Min.</td>
</tr>
<tr>
<td>Ticket, Tarp, Sampling</td>
<td>5 Min.</td>
</tr>
<tr>
<td>Haul to Lay Down</td>
<td>20 Min.</td>
</tr>
<tr>
<td>Delay at Job</td>
<td>15 Min.</td>
</tr>
<tr>
<td>Truck Exchange</td>
<td>2 Min.</td>
</tr>
<tr>
<td>Dump</td>
<td>3 Min.</td>
</tr>
<tr>
<td>Return to Plant</td>
<td>20 Min.</td>
</tr>
<tr>
<td><strong>Total Cycle Time</strong></td>
<td><strong>85 Min.</strong></td>
</tr>
</tbody>
</table>

- Delay at Plant                  | 2 Min.     |
- Loading Time                    | 2 Min.     |
- Ticket, Tarp, Sampling          | 2 Min.     |
- Haul to Lay Down                | 16 Min.    |
- Delay at Job                    | 4 Min.     |
- Truck Exchange                  | 2 Min.     |
- Dump                            | 3 Min.     |
- Return to Plant                 | 16 Min.    |
| **Total Cycle Time**            | **47 Min.**|

Cost Cycle: $120.7
Cost / Ton: $6.04
Trucks Required: 17

Cost Cycle: $66.74
Cost / Ton: $3.34
Trucks Required: 10

2400 tons X ($6.04 - $3.34) = $6,480
Gross Loading

• Find methods to increase the load on each and every Truck

• Use truck scales to maximize the GVW of each Truck
- Production: 240 tons per hour = 2,400 tons per day
- 20 Tons per Truck
- Truck Cost: $85 per hour = $1.42 per minute

Increase Truck Load To 21.5 Tons Per Truck

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time (Min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay at Plant</td>
<td>2</td>
</tr>
<tr>
<td>Loading Time</td>
<td>2</td>
</tr>
<tr>
<td>Ticket, Tarp, Sampling</td>
<td>2</td>
</tr>
<tr>
<td>Haul to Lay Down</td>
<td>16</td>
</tr>
<tr>
<td>Delay at Job</td>
<td>4</td>
</tr>
<tr>
<td>Truck Exchange</td>
<td>2</td>
</tr>
<tr>
<td>Dump</td>
<td>3</td>
</tr>
<tr>
<td>Return to Plant</td>
<td>16</td>
</tr>
<tr>
<td>Total Cycle Time</td>
<td>47</td>
</tr>
</tbody>
</table>

Cost Cycle: $66.74
Cost / Ton: $3.10
Trucks Required: 10

Cost Cycle: $120.70
Cost / Ton: $6.04
Trucks Required: 17

Additional $60,000 a year savings at 250,000 tons
Review Truck Specs

- Trucks are typically overspec’d for use
- Consider using lighter trucks for increased hauling weight
- Most often trucks have higher HP than required, structural components made of steel instead of lighter alloys
- Trade trucks more often to get increased hauling loads to offset costs
Conclusion

• Do not Over-Truck
• Have an alternate use for the trucks, during slow times of day
• Double-haul when possible
• Eliminate all delay...keep the trucks moving
• Keep the Drivers in the Trucks
New NAPA Publication coming out soon

“The Energy Audit”
Technical Papers

**Updated! T-127**
Milling and Recycling
1.9 mb

**T-117**
Segregation: Causes and Cures
2.4 mb
Flow Chart 5.5 mb

**T-119**
Dryer Drum Mixer
465k

**T-125**
Evolution of Thermal Remediation
221k

**T-129**
Stockpiles
670k

**T-138**
Hot Mix Glossary
Defines about 400 special terms frequently used by people in the hot mix asphalt industry. Most are not defined in standard dictionaries. 68 pages.
355k

**T-139**
Baghouse Applications
3.3 mb

**T-143**
Hot Mix Blue Smoke Emissions
2.1 mb

http://www.astecinc.com/literature/default.htm
NAPA plays a vital role in keeping the HMA industry vibrant and profitable. Supporting NAPA is one way that companies can make sure that the industry will stay healthy tomorrow. NAPA is an investment that pays dividends for its members today and in the future.

### NAPA Membership Dues

- **Minimum Dues of $1,000 per Year**

<table>
<thead>
<tr>
<th>Tons</th>
<th>Rate per Ton (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plus next tons over 5,000,000</td>
<td>@ 0.55¢ per ton</td>
</tr>
<tr>
<td>Plus next tons between 1,000,000 AND 5,000,000</td>
<td>@ 0.60¢ per ton</td>
</tr>
<tr>
<td>Plus next tons between 500,000 AND 1,000,000</td>
<td>@ 1.35¢ per ton</td>
</tr>
<tr>
<td>Plus next tons between 100,000 AND 500,000</td>
<td>@ 1.85¢ per ton</td>
</tr>
<tr>
<td>For first tons up to 100,000</td>
<td>@ 3.25¢ per ton</td>
</tr>
</tbody>
</table>
NAPA’s Diamond Achievement Commendation

- Appearance
- Operations
- Environmental

- Safety
- Regulatory Compliance
- Community Relations
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrow Road Construction</td>
<td>Fox Lake Asphalt Plant</td>
</tr>
<tr>
<td>Plant #1 Mt. Prospect</td>
<td></td>
</tr>
<tr>
<td>Plant #3 Carpentersville</td>
<td>Plote Construction, Inc.</td>
</tr>
<tr>
<td>Central Blacktop Co., Inc.</td>
<td>Allied Asphalt at Franklin Park</td>
</tr>
<tr>
<td>Quarry Materials – Hodgkins Plant</td>
<td>Allied Asphalt at Huntley</td>
</tr>
<tr>
<td>Gallagher Asphalt Corporation</td>
<td>Allied Asphalt at West Chicago</td>
</tr>
<tr>
<td>Joliet Plant</td>
<td></td>
</tr>
<tr>
<td>Thornton Plant</td>
<td></td>
</tr>
<tr>
<td>Geneva Construction Co.</td>
<td>Rockford Blacktop Construction</td>
</tr>
<tr>
<td>North Aurora</td>
<td>Nimtz Plant</td>
</tr>
<tr>
<td>K-Five Construction</td>
<td></td>
</tr>
<tr>
<td>Chicago Plant</td>
<td>E.T. Simonds Construction</td>
</tr>
<tr>
<td>Dupage Materials</td>
<td>Anna Plant</td>
</tr>
<tr>
<td>Lemont Facility</td>
<td>Campbell Hill Plant</td>
</tr>
<tr>
<td>Markham Facility</td>
<td>Shetlerville Plant</td>
</tr>
<tr>
<td>Naperville Facility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Southern Illinois Materials Co., Inc.</td>
</tr>
<tr>
<td></td>
<td>Asphalt Plant #1 Buncombe</td>
</tr>
<tr>
<td></td>
<td>Asphalt Plant #2 Mt. Vernon</td>
</tr>
</tbody>
</table>
NEXT WEEK

World of Asphalt 2007
SHOW & CONFERENCE
MARCH 20-22, 2007
MARCH 19-22, 2007
ATLANTA, GEORGIA USA

National Center for Asphalt Technology
NCAT
AUBURN UNIVERSITY

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION