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Efficient Trucking



The Road
Forward





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PAVEMENT ASSOCIATION**

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The Road Forward is an initiative of the asphalt pavement industry, with the committed support of NAPA members, partners, and staff, to achieve net zero carbon emissions by 2050.

Learn more about the initiative and find additional resources at AsphaltPavement.org/Forward.

NAPA thanks the following members for their generous support of The Road Forward.



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Introduction

Transportation emissions (A2) represent approximately 5% of the cradle-to-gate total greenhouse gas (GHG) emissions (A1-A3) for U.S. asphalt mixture production (Shacat et al., 2022, GHG Emissions Inventory for Asphalt Mix Production in the United States). It is fair to assume that the transportation of the mixture from the gate to the project site would add an equivalent amount of emissions as the transportation of the raw goods to the production facility. If trucking represents 5-10% of the GHG emissions from asphalt production and placement, a focus on efficiency must be part of lowering the industry's footprint. Additionally, trucking represents a significant cost in the production and placement of asphalt mixtures. With the cost-competitive nature of the work, letting inefficient trucking operations add cost to your operation will eat into the profit a company can realize. Compounding the cost impacts are the

realities that the industry faces trucking shortages and rising transportation costs. The number of trucks available can be a limiting factor for operations, so optimizing this resource becomes critical to completing work on schedule.

In the effort to optimize trucking operations, asphalt producers can separate their efforts into three focus areas:

- Planning
- Scheduling
- Management/Execution

Within each of the focus areas, there are several strategies and management techniques that can be evaluated to ensure the company's trucking operations are efficient and effective. A Tactical Checklist is a tool that asphalt producers can use to quickly complete a self-audit and focus on opportunities of operational improvements for their trucking operations.



Courtesy BOMAG Americas

planning

The planning stage of a project is an important step where companies can set goals, improve communication and teamwork, enhance decision making, and develop performance measures to assist project management with meeting goals and desired outcomes. While many asphalt producers have multiple projects being completed at one time, planning that addresses the broader operational needs is also valuable for achieving the company's desired goals and outcomes. Areas where asphalt producers can set goals and prepare to achieve efficient trucking during planning are:

RESOURCE LEVELING

Trucking is one of many resources required by companies to produce and place asphalt pavements. Proper planning works to ensure that a company's workload is

not overextending the available trucking assets. Detailed or segmented planning can be employed to address production demand, which can allow for staggering of trucking requirements for single or multiple projects to avoid being spread too thin and later creating scheduling conflicts or challenges.

Planning for steady trucking requirements allows contractors to provide regular work, helping outside trucking subcontractors reduce the challenges of trying to keep their fleets busy during slow times. When using subcontracted trucking, use strategies to secure the required resources so your resource planning is not thwarted by truck shortages. In addition to providing steady work, these strategies can include subcontracting techniques and other methods to ensure DBE requirements are able to be met.



Courtesy Payne & Dolan

ELIMINATE DEAD HEADING

Asphalt companies can further improve trucking efficiency by setting project and operational goals and strategies for eliminating or limiting the distances traveled by empty haul trucks. At the project planning stage, look for opportunities to have haul trucks back-hauling millings on a mill and fill job. While the trucking requirements may not be cut in half due to some of the imperfect truck cycling through multiple operations, the back-hauling can significantly improve trucking efficiency. Caution: back-hauling has the potential to create mix contamination, due to the possibility of millings sticking to the hot haul beds, if additional cleanout measures are not in place.

In addition to back-hauling, companies may have other opportunities to reduce distances that haul trucks are traveling

empty. One example is using haul trucks for stockpile inventory management. In all cases where haul trucks are being used to haul different materials (asphalt mixtures, millings, virgin aggregates, etc.), employ clean-out procedures that eliminate contamination that might lead to mixture quality concerns.

HAUL ROUTES

Planning of haul routes allows the trucks to use the most fuel-efficient routes (avoiding hills, multiple stops, etc.) and to bypass other construction or traffic delays. The plan should include not only how to get to and from the job, but also how to get into the job, so time and fuel aren't wasted driving around or turning around to offload into the paver. Such factors not only increase project costs due to wasted fuel and drive time, but also increase the risk that the truck may damage property driving over areas that they should not.



Courtesy BOMAG Americas

Scheduling project work is an essential task to ensuring work is completed on time and on budget. Areas where asphalt producers can improve trucking efficiency while scheduling work are:

RESOURCE ASSIGNMENT

One critical piece of a balanced operation is assigning the correct number of trucks to the job. Being short trucks will slow paving and will result in reduced production speeds or additional plant stops and starts. Too many trucks leads to queued trucks and other traffic challenges, trucks idling, and wasted time waiting to be loaded/unloaded. Being heavy or light on trucks will impact efficiency and costs as well as the consistency of the operation, which can lead to a lower quality pavement being placed. Emissions from the operation will be negatively impacted in all cases where trucking resources are not aligned with a balanced operation, whether it is paving equipment idling or slowed while waiting for mix, the asphalt plant adding more starts and stops to production, or trucks idling while waiting their turn to back into the paver.



Courtesy Asphalt Pavement Association of Michigan

Additionally, if the pavement quality suffers due to inconsistent operations, the pavement's service life could be reduced, which will have a negative impact when assessing the emissions and cost across the life of the asset.

Projects and operations often have days where it will likely be necessary to alter the rate of placement and production. Examples are times when you may finish mainline paving and drop back to pull intersections, or paving in a parking lot with many islands and light poles and then switching to paving an access road at that property. Having an operational plan for trucks to make in-day moves will ensure that trucking can maintain a balance with changes in demand for material delivery.

MINIMIZE CYCLE TIME

To minimize cycle times, it is important to have the correct number of trucks assigned to the balanced operation, but there are additional areas to achieve optimal cycle times for trucks. Scheduling work to occur in off-peak traffic times can avoid trucks being delayed in back-ups and other unexpected problems (like blocked lanes and accidents) that are more likely to occur during heavy traffic.

While staggering start times is included in planning, a more detailed look at staggering your trucking during scheduling can avoid unwanted inefficiencies. Operations can also stagger start times for jobs, and production of different mixes, to reduce the need for plant starts and stops and better balance demands on the production facility. The load times should not be scheduled more frequently than the plant can load trucks. This can vary based on the number of scales as well as how many mixes and jobs are loading at the same time. Likewise, trucks should not be loaded more frequently than the paver can unload them.

- There may also be other activities, such as QC/QA sampling from the truck haul beds, that can impact truck cycle time.
- Most often these operations will have minimal impact, but understanding job requirements and all the activities that will influence trucking is important when addressing cycle time and assigning the correct number of trucks.

ON-DEMAND TRUCKING

- Like many things in life, being able to access things on-demand is convenient and desirable. On-demand can also lead to efficiencies, such as being able to stream a movie on-demand vs. getting in the car to drive to the store to rent a movie – using time and fuel. Trucking traditionally has involved contracts and steps that limited the ability to find an available truck at a moment's notice close to the project when higher production rates are desired. Technologies are starting to open doors where this type of on-demand utilization of trucks is becoming more accessible and the industry is evolving to take advantage of these options. Alternate non-critical hauling, such as stockpiling aggregates at the plant, can be used with or without these technologies as a resource for on-demand trucking.

COMMUNICATION

- Good communication is critical in all aspects of business and there are specific details that need to be communicated to drivers to ensure trucking operations do not face unexpected outcomes and delays. To minimize congestion and other unnecessary challenges when starting a production day, and to ensure that trucks are not showing up at the site to see if they have work for the day, communicate the expected arrival time for each truck with the drivers. Additionally, drivers need to know details such as their access point at the job site, where they are to clean

out, and any queue locations if they are required to wait to unload or load. These communications can avoid issues with drivers choosing their own routes and eliminate distractions caused by truck drivers visiting with the plant operator during a busy part of the day.

Additional details on the day's plan can help truck drivers avoid errors and proactively communicate issues that may arise. Some details to communicate to truck drivers on the paving day plan are materials to be hauled, number of loads and rounds expected, scheduled tonnage, and expected cycle times. For example, this information empowers a driver to notice when their cycle times are off and communicate if there is traffic or other circumstances causing this to occur. Having an effective means to communicate with drivers during the job when conditions change is very beneficial. Examples for engaging this type of communication include when a train is blocking a railroad crossing or trucks need to access the job site through a different project entrance. Using technologies to broadcast messages to all drivers, or targeted to individual drivers, can maintain or improve operational efficiency. Additionally, having a means for traffic control personnel and truck drivers to communicate on projects can assist with limiting the time that trucks are being held up in the waiting line of traffic when flagging operations are prioritizing traffic flow through the project.

Staying on schedule and adjusting the schedule depend on good communication between the plant and paving crew. The paving crew needs to accurately measure, calculate, and communicate to the plant reliable tonnages. Furthermore, the tonnage estimates should be revised by checking yields throughout the day and providing updated information to the appropriate persons (e.g., the plant, management, etc.).

TRAINING & COMMUNICATION

Without proper training and communication, operations will suffer, causing ranging impacts that often lead to inefficiencies that hurt profitability. In addition to lost profitability, trucking inefficiencies often result in increased emissions. Training for truck drivers should cover several key areas, which include safety, standard operating procedures, and best practices. Examples of important sub-topics are:

Safety Training Topics

- Understanding and avoiding hazards at the job site and plant site (e.g., overhead lines, traffic patterns, signage, etc.)
- Backing and job site maneuvering

Standard Operating Procedures

- Procedures for allowing paver to engage truck
- Signals or communication for dumping
- Plant loadout (i.e., proper positioning of truck with possible multiple dumps)
 - Lights, radio, horns, and other positioning systems

- Type, application, and frequency of truck bed release agents
- Tarping the load
- Unloading to avoid segregation and overloading

Best Practices

- Proper haul bed cleaning / inspection prior to shift start and after back-haul activities
- Safety walkaround, pre- and post-trip inspections by truck drivers
- Scheduled fueling, planned pre- or post-trip fueling of vehicles

OPERATIONS

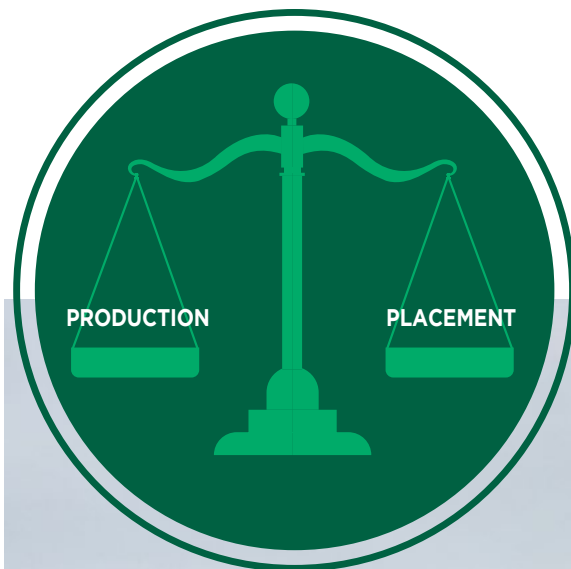
There are several opportunities to ensure efficiency in trucking operations. One is providing tools to ensure trucks haul full legal loads resulting in maximum materials/weights being transported – reducing the number of trucks needed for operations. Start with attention to truck and trailer specifications for maximum legal load capacity during the



Courtesy Asphalt Pavement Association of Michigan

procurement of equipment. Maximizing the loads hauled will result in economic and emissions efficiency. While modern plant loadout systems should have no trouble maximizing loads, tools such as mill conveyor load cells, weigh in motion systems, and an automated performance tracker are tools that can further help producers and contractors achieve fully loaded trucks when traditional loadout weight systems do not exist.

Another opportunity to address efficiency is with start up and silo procedures. It is best to stagger start times for trucks and production demand to balance the plant's operations. Using the silos to handle some initial surge demand on the plant is one of the utilities of the onsite storage, but operators should avoid using trucks as silos, or surging material into trucks that will then sit idle prior to unloading.



Using a material transfer device (MTD) can also help trucking efficiency. The MTD can serve as a surge bin that provides additional storage capacity at the job site and helps ensure trucks are able to unload upon arrival. In addition to the improved efficiency with truck unloading, MTDs can serve to improve quality by remixing the material prior to placement to help protect against/mitigate thermal and physical segregation that might have occurred prior to delivery at the job site. The MTD also transfers the mix into the paver without direct contact to the paver, which can lead to improved ride quality, especially in cases where truck drivers struggle with properly backing into the paver to dump.

Like planning and scheduling, the production and placement should be conducted with balanced operations and as much consistency as possible.

Balance refers to aligning the rate of mix production with the rate of shipment to the job site and the rate materials are placed.

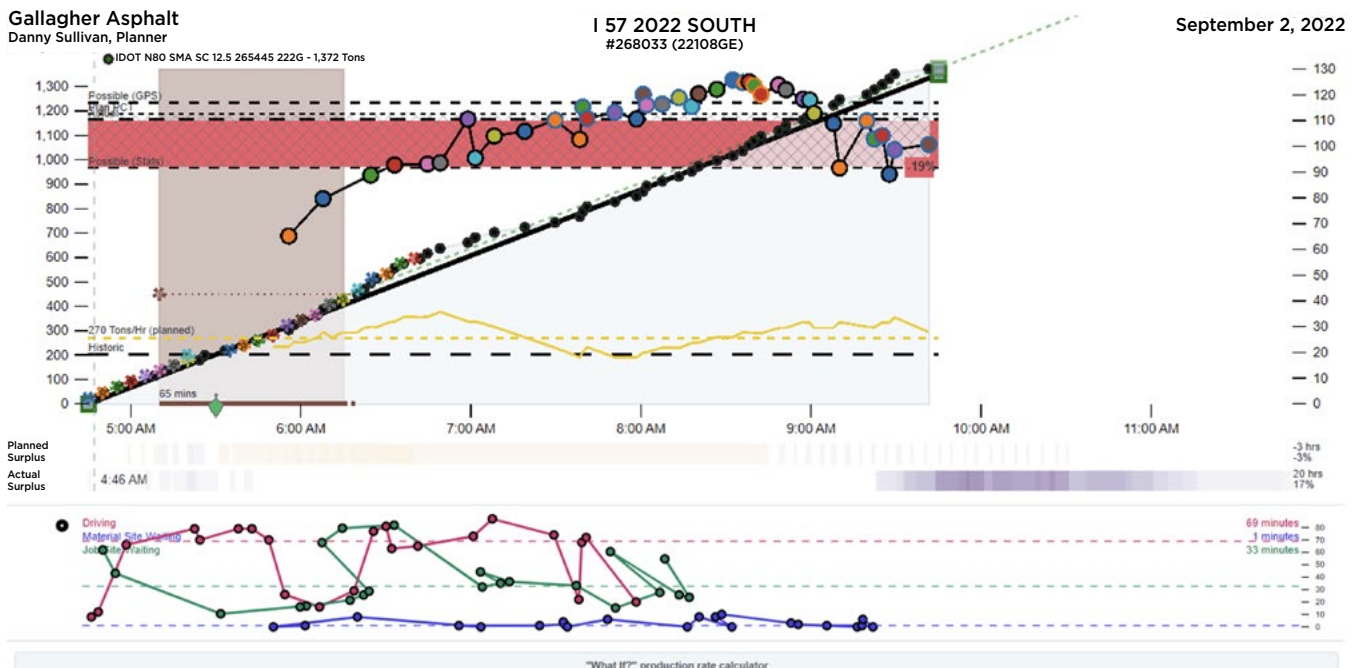
Balance is easiest to achieve and maintain when steady production rates are employed



Courtesy Asphalt Pavement Association of Michigan

- Use tools to optimize drivers' time.
- Examples include automated systems to apply release agent to truck beds prior to load out, E-ticketing and ticket printers/ systems that allow for quick exit after loading and don't require the driver to get out, automatic truck bed sampling

The last opportunity relies on having a good plan and executing it on a daily basis. In addition to good communication, job efficiency can only be achieved when accurate measurements are taken and the paving crew and plant operation do not fall into the end-of-day “one more load” scenarios that can too often happen. The fallout from this type of breakdown is more than frustration; it can impact how efficiently trucks are signed out, lead to significant delays while the crew waits for the plant to fire up to make a little more mix, and in the end waste time and fuel.



8

TELEMATICS

Technology allows for real-time electronic monitoring of trucking operations, an important aspect of managing the fleet's performance. Telematics provide tools to manage asset utilization, from ensuring drivers are taking the correct routes with lane monitoring and identifying if detours or unplanned stops are occurring, all the way to identifying whether pieces of equipment are inefficient. The tools also provide safety data, such as hard braking, following posted speed limits, and other areas of concern where management can take corrective action and provide additional training with documented occurrences. Telematics can also help automate preventive maintenance service scheduling and reminders, along with identifying whether drivers are misusing or hard on the equipment. All of this information can be provided to the correct personnel, such as truck location being made available to plant operators or the equipment maintenance needs being sent to the shop.

LOGISTICS & PROCESS ANALYSIS

Managing trucking across a company's many operations can pose challenges and lead to missed opportunities in ultimate efficiency when hauling materials. Technology platforms to address some of these difficulties are now available from a number of providers. The platforms offer different features, but they empower companies to act and manage trucking operations on a real-time basis. Live monitoring of an operation's production rates, cycle times, and truck locations are some of the parameters included.

Harnessing technology to provide visual monitoring tools helps companies manage trucking in real time.

These platforms also can provide streamlined solutions with many aspects of trucking logistics, with tools for planning, scheduling, communication, load ticketing, reporting, payroll, and job performance reporting.



Courtesy Dawn Mcgee

EVALUATING YOUR TRUCKING

Use this short tactical checklist for truck management to evaluate your operations and identify opportunities to increase efficiency.

Truck Management

PRE-PROJECT PLANNING:

- 1 Using a paving calculator, the paving speed that is known to achieve density, ride quality, and the desired shift tonnage, establish the ton per hour required for this shift. _____
- 2 Establish the total tons desired for this project shift. _____
- 3 Based on other projects required from the plant, can you be assured of both the rate and the total tonnage out of the plant facility? ____ Yes ____ No
- 4 Establish the fastest route to the project to minimize truck drive time.
- 5 Establish the minimum number of trucks required for this project/shift based on the following calculations:
 - a. Number of loads required per hour based on the target tph from item 1 above divided by the average load size = _____ loads per hour at paver
 - b. Load Time at Plant _____ minutes
 - c. Travel Time to Job _____ minutes
 - d. Dump Time at Paver _____ minutes
 - e. Cleanout Time on Job _____ minutes
 - f. Return Trip Time _____ minutes
 - g. Round Trip Total Time _____ minutes
 - h. Divide Round Trip Total Time (g) by 60 and then multiply by the number of loads required per hour at the paver (a) to establish the Minimum No. of Trucks Required ____ (Round up! No such thing as a partial truck!)
- 6 Note that you can add “truck cushion” to the calculation by either adding cushion time to the Round Trip Total Time (which will force an additional truck into the final equation) or you can just add an additional truck for insurance against paving stoppages without adding cushion time in the calculation; but if your calculations have already made you round up, you might already have a spare truck on the job.
- 7 If you are worried about the mechanical reliability of the truck fleet, you might want to add another truck to the schedule.
- 8 Adding an MTV for this project may reduce the need for you to add “extra trucks” on this project. Calculate the payback ratio for the MTV by dividing the total cost of the additional trucks you added for the shift by the cost of an MTV delivered and operated on the shift. Any ratio above 1.0 is a positive payback based on trucking. Trucking Cost Reduction MTV Payback Ratio = _____

- 9 Adding an MTV on this project may increase the probability of a paving bonus. This is typically more of a subjective decision than an objective one, but you can calculate the objective payback ratio by dividing the total shift bonus potential (estimated tons x estimated bonus per ton) by the cost of an MTV delivered and operated on the shift. Any ratio close to 1.0 or above 1.0 is probably a good project decision based on the smoothness bonus potential. Smoothness Bonus MTV Payback Ratio = _____
- 10 These calculations help minimize trucking costs AND fuel consumption (greenhouse gas emissions) by keeping unnecessary trucks off the job and off the street. Other things that can reduce fuel consumption and emissions are:
- a. Selecting trucks with more fuel-efficient engines.
 - b. Selecting trucks that automatically shut off after idling so many seconds/minutes.
 - c. Monitoring truck speed or enforcing truck speed in a more fuel-efficient range (note: the above calculations should therefore be done at those speed rates). (Tip: fleet management software tools make monitoring compliance to speed targets very easy.)
- 11 Several truck fleet management tools are on the market, many of which work off either GPS devices in the truck or track GPS position from the driver's cell phone. These products offer the following data and management tools, which allow you to monitor the current project and plan for efficiency on future projects.
- a. Total cycle time can be monitored.
 - b. Vehicle speed can be monitored.
 - c. Length of time in each "zone" can be monitored or evaluated post-project; such as "time waiting at plant," "time travelling to job," "time waiting at paver," "time during cleanout," "time returning to plant," etc.
 - d. Time away from the established route can be monitored.
 - e. Average cycle time per vehicle can be monitored.

POST-PROJECT ANALYSIS:

See Item 11. These truck management software tools are very helpful in tracking truck flow and trucking efficiency. They can show if too many trucks are on the job, as "wait time" at the paver will be excessive. Excessive "wait time" at the plant can be an indication that the plant is over-committed and having trouble keeping up with all projects. Traffic problems show up in long transit times. Total cycle times will also increase with any of these conditions. Comparing transit times between vehicles provides a useful glimpse into whether some trucks are diverting from established routes, taking unscheduled breaks, or having mid-shift mechanical problems. If you do not have this type of fleet management software, filling out the attached manual tracking form during loadout at the plant can provide the same sort of data, allowing you to compare number of hauled loads, cycle times, and total time.

DATE _____

PLANT # _____

PLANT OPERATOR _____

[illegible]

Comments