

**Grab a clipboard and take this map along on your treasure hunt.** Focus on uncovering opportunities to save. When you find something, make notes about location; tools, materials, or expertise needed; or further research required. Feel free to add to or modify this list to suit your own needs. For more treasure hunt resources, visit [www.energystar.gov/treasurehunt](http://www.energystar.gov/treasurehunt).

Facility Name \_\_\_\_\_ Date \_\_\_\_\_ Team \_\_\_\_\_



## Facility Management

- Review the plant's energy tracking system, billing records, or other sources of consumption data. Identify any spikes or unusual changes in energy use over the past year.
- Check the facility's energy action plan and reports from energy audits, assessments, and treasure hunts (if available) to see if earlier identified energy savings measures have been implemented.
- Inspect maintenance plans and records to identify areas to review during the treasure hunt. Routine or preventative maintenance on neglected equipment may yield energy savings.
- Review building management system (BMS) and/or building automation system (BAS) code, if applicable, to ensure that specific commands to reduce unneeded energy consumption (e.g., on/off times) remain active.
- Consider facility maintenance during daylight hours to reduce the need for lighting and HVAC during unoccupied periods.
- Consider using software and control systems that provide real-time monitoring, including integration with real-time fuel sensors.
- Check that the facility has a comprehensive training program with energy management emphasis for plant operations personnel, and that all staff have been trained and receive periodic refresher training. For example, see sections 2.2 and 4.1 of the Energy Efficiency and Cost Saving Opportunities for Asphalt Mixture Production guide.

### NOTES:



## Dust Collectors

- Verify proper dust collector maintenance schedules are being followed, including:
  - Identify leaks. Track identified leaks to ensure they are sealed. Replace dust seals regularly, and inspect hidden areas around augurs and chutes.
  - Inspect pulse air jets. If automated to be controlled by differential pressure, confirm correct operation.



- Inspect mechanical shakers.
- Inspect bags.
- Inspect cartridges.
- Optimize exhaust gas temperature to keep temperature closer to the dewpoint.
  - Consider real-time moisture sensors to determine the current dewpoint and adjust operations to align more closely.
  - Consider automating drum speed to maintain the target exhaust gas temperature for the baghouse.
  - Consider using a small, secondary burner to reheat exhaust gas before it enters the baghouse if temperature falls too close or below dewpoint.
- Assess, or consider employing, a minimum effective draft by using dampers and/or variable-speed fans to control the draft.
- Consider replacing manual dust collectors with automated dust collectors.
- Check fans. Resize and/or slow down fans (e.g., with variable frequency drives (VFD)) that are too big.
- Check the differential pressure across the dust collector (pressure difference between the dirty and clean side of the bags). Maintain pressure between 4 and 5 inches of water.
- Consider using a differential pressure control system on the cleaning system.
- If using a compressed air jet-pulse cleaning system, check that the system is using the minimum effective pressure (usually 60-70 psi).
- Consider using a short pulse to shake extra dust off in the case of compressed air blowdown systems.
- Inspect for hot spots on duct work and exhaust fans using an infrared camera on a yearly basis.
- Inspect system insulation in duct work and baghouse. Repair or replace damaged insulation, or add insulation where current insulation is inadequate.

## NOTES:



## Aggregate Handling, Drying and Heating

- Check that aggregates are under shelter to avoid moisture increases.
- Check that stockpiles have adequate drainage. Consider creating paved and sloped areas for stockpiles. Check that loader operators take aggregates from higher in piles when loading aggregate bins.



- Consider grading site to eliminate inclines to the cold feed bins to reduce fuel consumption and loader wear.
- Evaluate burner efficiency. Check that burners are tuned at least once per year, and more often if they use less clean fuels. Check that regular maintenance (e.g., burner cleaning) is performed and documented. Consider VFD for drum. Ensure operators are trained on operating efficiently.
- Consider checking burner using a gas analyzer and document the oxygen and carbon monoxide percentages (O% and CO%) and NOx (ppm).
- Inspect drying drum casing insulation. Repair or replace damaged insulation or add insulation where current insulation is inadequate. Use thermal imaging camera technology to evaluate.
- Inspect air dampers on inlet and outlet ends of drum, and on RAP inlet.
- Evaluate opportunities to optimize drying drum exit temperature.
  - Evaluate condition of flights, and replace worn flights if inefficient veiling is causing high exit gas temperatures.
  - Evaluate the flight configuration for the types of mixes and range of RAP content.
- Consider options for reducing material temperature using warm-mix asphalt.
- Consider alternative equipment, especially electric equipment (e.g., electric drive wheel loader)
- Consider opportunities for optimizing production, especially by reducing stops and re-starts that can use more energy. Ensure operators are trained in maximizing production efficiency.

**NOTES:**



## 4 Asphalt Cement and Heating

- Inspect hot-oil heaters. Check that burners are tuned at least once per year, and operators are trained on operating efficiently.
  - Check stack exit gas temperatures for fuel-fired heaters. If temperatures are high, consider replacing or rebuilding the heater, or adding a heat exchanger to the exhaust stack to capture waste heat and use it to preheat the heat transfer oil.
  - Consider checking burner using a gas analyzer and document the oxygen and carbon monoxide percentages (O% and CO%) and NOx (ppm).
  - Replace heaters with high-efficiency electric heaters.



- Inspect piping insulation for any gaps or damage. Consider insulation on all system elements (e.g., jumper lines, valves, and manholes). Repair or replace damaged insulation or add insulation where current insulation is inadequate. Use thermal imaging camera technology to evaluate.
- Inspect tank and silo insulation for any gaps, damage, or water infiltration. Repair or replace damaged insulation or add insulation where current insulation is inadequate. Use thermal imaging camera technology to evaluate.
- Evaluate opportunities to add lignin to asphalt.

## NOTES:



## 5 Reclaimed Asphalt Pavement/ Recycled Asphalt Shingles

- Check that fighting is configured to optimize veiling efficiency given the typical range of RAP content the plant produces.
  - Verify processes are established to pre-inspect every incoming load of RAP at the production plant and stockpile for contaminants.
  - Consider options for stockpiling broken RAP separately from milled RAP.
  - Evaluate opportunities for covering RAP stockpiles.



## 6 Truck Operation and Fleet Management

- Coordinate trucking and the scheduling of third-party orders so that production at the plant is balanced with demand. Optimizing production saves energy by reducing stops and re-starts.
- Back-hauling RAP. On milling projects, ensure the same trucks that deliver asphalt mix to the job site are used to back-haul RAP to the plant.
- Analyze fuel consumption. Verify that information on miles and hours driven, and time spent idling (including loading and traveling off-road) are tracked and analyzed to optimize fuel efficiency.
- Inspect, or consider installing, diesel flow meters in trucks to provide more precise information on real-time fuel consumption.
- Identify opportunities to reduce idling time, including:
  - Shutting off the engine between loads.
  - Training fleet coordinators on improving truck dispatching.



- Identifying technologies that reduce idling time, such as automatic release agent spraying system, automatic tarping, and automatic ticket writers.
- Wiring radios to the battery to avoid needing the engine on to power the radio.
- Evaluate current routes. Consider a route-planning system (such as GPS) to save fuel by finding shorter distances to desired locations.
- Optimize capacity. Ensure a company's own trucks are loaded to their gross weight rating to minimize the number of truck loads to individual job sites.
- Engine block heaters. When cold weather necessitates engine block heaters, ensure the heaters are on timers.



## Compressed Air

- Evaluate proximity of compressor to factors that may impact its operational efficiency (e.g., excess dust, heat from a nearby source), and consider relocating compressor if necessary.
- Verify proper maintenance schedules are being followed, including:
  - Check filters are cleaned or replaced.
  - Check O-rings.
  - Check motors and compressors are properly lubricated.
  - Inspect fans and pumps where applicable.
  - Inspect drain traps periodically to ensure they are clean and not stuck in the open or closed position.
  - Inspect belts, where applicable.
  - Specify pressure regulators that close when failing.
- Review compressed air applications for excessive pressure, duration, or volume.
- Inspect, or consider installing, ultrasonic acoustic detector to identify leaks and the high-frequency hissing sounds associated with air leaks.
  - Track identified leaks to ensure they are repaired. Develop a leak program to assure leak detection and correction are ongoing.
- Confirm air is completely turned off to equipment no longer active (at solenoid valve).

### NOTES:



- Assess, or consider implementing, a control strategy to ensure that only the right amount of compressed air, at the right time, is generated and used in the production system.
  - To determine proper control systems, assess compressed air requirements over time to establish a load profile.
- Evaluate if air pressure can be reduced to the lowest practical set point. Every 2-3 psi decrease in system pressure can reduce energy use of the compressors by 1%.
- Assess if pneumatic controls or tools can be replaced with electric systems.
- Identify opportunities for heat recovery of wasted heat from the compressors.
- Identify opportunities to replace compressors with a variable speed drive (VSD) compressor.
- Evaluate compressor load profiles to reduce partially loaded compressors. Verify compressor controls are sequenced properly to avoid frequent loading/unloading.
- Evaluate the potential to reduce header pressure during non-production time.
- Evaluate overall preventive and predictive maintenance of system.
- Confirm overall control system operations.

## NOTES:



## Motors

- Locate and identify all motors. Inventory conditions and specifications of each motor.
- Assess motor needs against actual use to determine if properly sized to meet the needs of its driven equipment. Replace wrong-sized motors with correct size and high-efficiency motors.
- Consider maintenance, repairs and upgrades to the motor systems, including economic costs and benefits using life-cycle costs.
  - If upgrades are pursued, monitor the upgraded system's performance to determine actual cost savings.
  - Consider purchasing energy-efficient motors in order to reduce the motor's life-cycle costs.
  - Consider replacing smaller motors with NEMA Premium® efficiency motors.



- Evaluate overall preventive and predictive maintenance of system.
- Confirm overall control system operations.
- Check shutdown practices for motors that are not in use to prevent idling. Consider automatic shutdown of motors.
- Consider adjustable-speed drives (ASDs) and VFDs based on use pattern of motors.
- Consider replacing generators and diesel engines on crushing equipment with motors.
- Inspect electrical cabinets and high output large bearings with infrared cameras and record findings yearly.

**NOTES:**



## Lighting

- Identify where lights have been left on in unoccupied spaces (e.g., common areas, storage rooms, restrooms, break rooms, outdoor areas).
- Identify and assess opportunities to use automated lighting controls:
  - Occupancy/motion sensors for low-traffic areas.
  - Timers or daylight sensors to dim or turn off exterior lights during the day.
  - Dimming controls in locations where there is natural lighting (e.g., near windows).
- Confirm that installed lighting controls are operating as intended.
- Assess need to institute a regular cleaning plan for lamps/fixtures for maximum light output.
- Identify where reflectors can be practically added to existing lighting.
- Assess whether any areas are over-lit, compared to requirements or design levels; consider opportunities for de-lamping.
- Identify and de-energize and/or remove fixtures and ballasts that are not in use.
- Evaluate the opportunity to upgrade to more energy-efficient lighting options:
  - Replace all lights with LEDs.
  - Use LED Exit signs in place of incandescent or CFL models.





## Building Envelope

Note: Some elements of this section may be relevant only to larger plants with attached office space. Please use judgement in determining which are applicable.

- Inspect doors and windows to identify gaps or cracks that can be repaired.
  - Note damaged or missing weather stripping.
- Note air leaks that should be sealed with caulking or other sealant.
- Inspect insulation and weatherstripping levels and identify inadequacies to be addressed (including loading docks and garage doors).
- Assess opportunity to install vinyl curtains in loading areas, if applicable.
- Note any doors left open to the outside and to any unheated or uncooled areas.
- Assess the opportunity to install solar film or other window coverings on east, west, or south exposures to reduce solar heat gain and heat loss.
- Assess the opportunity to install air lock doors for main entrances, if applicable.
- Assess the opportunity to install a reflective (“cool”) roof covering in warm climates.
- Assess the opportunity to use natural vegetation to moderate solar and wind impact.

NOTES:



## Plug Loads

Note: Some elements of this section may be relevant only to larger plants with attached office space. Please use judgement in determining which are applicable.

- Identify any new office equipment that will be needed soon; make plan to ensure they are ENERGY STAR certified where possible. ([www.energystar.gov](http://www.energystar.gov))
- Identify any equipment left on overnight (including those left in sleep/ idle or screen saver mode).
- Ensure that power management settings are activated on office equipment such as computers, monitors, printers, and copiers.





- Ensure that any large-screen TV monitors are turned off during unoccupied times.
- Use networked printers, rather than personal printers in offices or workstations.
- Identify and discontinue the use of personal heaters and fans in offices or workstations (the use of such personal devices may indicate broader hot/cold issues that should be addressed at the system level).
- Identify where power strips can be used for easy disconnect from power source. Consider the use of advanced power strips.
- Assess plan for educating staff to unplug rechargeable devices once charged.
- Check if vending machines get turned off or put in sleep mode at the end of the day.
- Consider installing motion/occupancy-based vending machine controls.
- Look for opportunities to replace older vending machines with new ENERGY STAR certified vending machines.

## NOTES:



## HVAC

Note: Some elements of this section may be relevant only to larger plants with attached office space. Please use judgement in determining which are applicable.

- Identify and make plans to address instances of simultaneous heating and cooling.
- Ensure that thermostats and outside air temperature sensors are properly calibrated/maintained.
- Ensure that thermostats are set to appropriate temperatures based on season and local weather conditions.
- Confirm proper implementation of a temperature setback policy for heating/cooling when the building is unoccupied (including any special considerations for summer months).
- Perform testing and balancing of air and water systems.
- Ensure that thermostats are properly located to be representative of the room or zone for which the temperature is being controlled.
- Ensure that electronics are located away from thermostats.
- Ensure that space heaters are not being used in offices, break rooms, and other spaces.



- Identify where locking covers for thermostats and ventilation controls can be installed to prevent unauthorized adjustments.
- Ensure free airflow to and from registers.
- Ensure window shades are available to block excess heat gain; make plan to educate staff about when to use them.
- Identify where ceiling fans can be installed to move and de-stratify air layers. Ensure all existing ceiling fans are operating properly.
- Monitor make-up air ventilation; ensure the proper functioning of dampers to achieve outside air requirements.
- Ensure that HVAC system components are being maintained regularly, including:
  - Replace filters on a regular schedule.
  - Inspect and clean evaporator and condenser coils.
  - Clean fan blades and adjust belts as needed.
  - Inspect water/steam pipes and ducts for leaks and/or inadequate insulation; address as needed.
  - Verify and calibrate operation of variable air volume (VAV) boxes, where applicable.
  - Evaluate furnace/boiler efficiency and clean/tune up as needed (including boiler water treatment and inspection of steam traps, as appropriate).
  - Check chiller and cooling tower components for fouling or corrosion; ensure proper water treatment is in place.
  - Check for unusual noise, vibration and/or decrease in performance of compressors/motors.
- Evaluate how chillers operate during the cold months and determine if chiller or pumps can be shut off.
- Identify and assess opportunities for installing VFDs for fan and pump motors, and VAV boxes in the ductwork – especially where variable loads are being served.
- Identify and assess opportunities for demand-controlled ventilation in areas with variable loads (e.g., meeting room, break room).
- Identify and assess opportunities to use occupancy sensors to control HVAC in offices or meeting rooms.
- Verify proper preventive and predictive maintenance schedules are being followed. Ensure all components are optimized.
- Determine whether economizer modes are being used.
- Confirm non-production modes are used, and schedules are being followed.

**NOTES:**





# Treasure Map FOR ASPHALT MIXTURE PRODUCTION PLANTS

**ADDITIONAL NOTES:**

