

C. What Operations Constitute Asphalt Processing and Asphalt Roofing Manufacture?

The final rule regulates both asphalt processing and asphalt roofing manufacturing operations. Asphalt processing and asphalt roofing manufacturing operations can be stand-alone or integrated with each other, or with related operations such as wet-formed fiberglass mat manufacturing. In addition, asphalt is processed at some petroleum refineries.

Processed asphalt is produced using asphalt flux as the raw material. Asphalt flux is a product that is obtained in the last stages of fractional distillation of crude oil. Asphalt is processed to change its physical properties for use in various end products (e.g., paving applications, roofing products). In asphalt processing, heated asphalt flux is taken from storage and charged to a heated blowing still where air is bubbled up through the flux. This process raises the softening temperature of the asphalt. The blowing process also decreases the penetration rate of the asphalt when applied to the roofing substrate. Some processing operations use a catalyst (e.g., ferric chloride, phosphoric acid) in the blowing still to promote the oxidation of asphalt. The need to use catalyst is primarily driven by the type of feedstock used. Certain low-quality feedstocks (which are used, however, by necessity because substitute feedstocks are not available, see 66 FR 58619) require catalyst to be used to attain desired product specifications.

In asphalt roofing manufacturing, processed or modified asphalt (also called modified bitumen) is applied to a fibrous substrate (typically made of fiberglass or organic felt) to produce the following types of roofing products: Shingles, laminated shingles, smooth-surfaced roll roofing, mineral-surfaced roll roofing, and saturated felt roll roofing. Modified asphalt is asphalt that is mixed with polymer modifiers (which add strength and durability to the asphalt) and is typically used to produce roll roofing products. A roofing manufacturing line is a largely continuous operation, with line stoppages occurring primarily due to breaks in the substrate.

In asphalt roofing manufacturing, asphalt is typically mixed with filler materials before application to the substrate. If a fiberglass substrate is used, coating asphalt is applied by a coater. If an organic substrate is used, a saturator and wet looper are typically used prior to the coater to provide additional time for the asphalt to

impregnate the substrate. The type of final product being manufactured determines the process steps that follow the coating or impregnation steps.

For shingles and mineral-surfaced roll roofing, granules are applied to the hot surface of the coated substrate. This step is omitted in manufacture of smooth-surfaced and saturated felt roll roofing. In shingle manufacturing, a strip of sealant (typically oxidized or modified asphalt) is applied to the back of the product after it has cooled. This sealant strip, which is heated by the sun after the roofing product is installed, provides some adhesion and sealing between layers of roofing product. In shingle manufacture, the coated substrate is cut into the desired size. Multiple single-ply shingles can be glued together (typically using oxidized or modified asphalt as an adhesive) to produce laminated or dimensional shingles. When asphalt roofing manufacturing lines are collocated with asphalt processing operations, the two operations typically share storage and process tanks.

D. What Are the HAP Emissions and HAP Emission Sources?

Asphalt is essentially the material that remains after fractional distillation of crude oil, with petroleum coke being the only other fraction available for recovery. Consequently, asphalt consists primarily of heavy organic compounds with low boiling points. Hazardous air pollutants are volatilized from asphalt as it is heated and agitated during processing and roofing manufacturing operations. Hazardous air pollutants are also volatilized during asphalt processing as a result of the oxidation reactions that occur in the blowing still.

Because the HAP volatilized from asphalt generally have low boiling points, they can be present in both condensed particulate matter (PM) and gaseous forms, depending on the temperature of the vent or exhaust gas. When the temperature of the vent gas is below the boiling point of a HAP, the HAP will condense into particulate form (i.e., a cooler vent gas will have more HAP in the form of condensed PM, whereas a hotter vent stream will contain mostly gaseous HAP).

The following types of equipment are sources of PM HAP and gaseous HAP emissions: Asphalt storage and process tanks, asphalt blowing stills, asphalt loading racks, saturators, wet loopers, coating mixers, coaters, sealant applicators, and adhesive applicators. The majority of uncontrolled HAP emissions from an asphalt processing and asphalt roofing manufacturing facility (approximately 50 percent,

based on the emission factors developed for this rulemaking) are contributed by the blowing stills, followed by the process equipment used to apply asphalt to the roofing substrate (e.g., coating mixers, saturators, wet loopers, and coaters). Asphalt processing operations can also be sources of HCl, if a chlorinated catalyst is introduced into the blowing still during processing. Since most blowing still emissions are controlled by a combustion device, chlorine compounds present in the blowing still exhaust are oxidized and emitted as HCl from the blowing still combustion device outlet.

E. What Are the Health Effects Associated With the HAP Emitted From the Asphalt Processing and Asphalt Roofing Manufacturing Source Categories?

A variety of HAP are emitted from asphalt processing and asphalt roofing manufacturing source categories. The following HAP account for the majority (approximately 98 percent, based on the emission factors developed for this rulemaking) of the total HAP emissions: Formaldehyde, hexane, HCl (at asphalt processing facilities that use chlorinated catalysts), phenol, and toluene. The remaining two percent of the total HAP emissions is a combination of several different organic HAP, each contributing less than 0.5 percent to the total HAP emissions.

The HAP emitted from these source categories (controlled under the final rule) are associated with a variety of adverse health effects. These adverse health effects include both chronic health disorders (e.g., irritation of the lung, skin, and mucous membranes, effects on the central nervous system, and damage to the blood and liver) and acute health disorders (e.g., respiratory irritation and central nervous system effects such as drowsiness, headache, and nausea). The EPA has classified two of the HAP (formaldehyde and POM) as probable human carcinogens.

The EPA does not have the type of current detailed data on each of the facilities and the people living around the facilities covered by today's rule for this source category that would be necessary to conduct an analysis to determine the actual population exposures to the HAP emitted from these facilities and the potential for resultant health effects. Therefore, EPA does not know the extent to which the adverse health effects described above occur in the populations surrounding these facilities. However, to the extent the adverse effects do occur, and this rule reduces emissions, subsequent exposures would be reduced.