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Industrial Hygiene Summary Reports

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Blown Asphalt Not Carcinogenic

Previously reported studies have shown that petroleum asphalts, shale oil asphalts, and coal tars exhibit distinct variations in their relative carcinogenicity for experimental animals as well as for man. Recent observations reported by Bogovoski indicate that aeration reduced the carcinogenic potency of Esthonian shale oil and prompted the present investigation of the carcinogenicity of blown petroleum asphalt. Four materials were applied twice weekly to the clipped necks of C57 black mice from the NIH stock: (1) benzol-soluble extract from natural Trinidad asphalt; (2) crude oil; (3) asphalt with a penetration of 150 to 200 (ASTM method), which is obtained by distillation from the crude oil and is then heated and treated with a stream of blown air to give (4) a highly oxidized "blown" asphalt. The crude oil was applied directly to the animals, but slight acetone dilutions of the other three materials were used.

The four materials tested proved to be noncarcinogenic or so weakly carcinogenic to the skin of C57 black mice that they did not elicit any cancers within the normal life span of the species and strain. The carcinogenicity of petroleum asphalts may be reduced by diluting them with natural asphalts or by converting them into blown asphalts.

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Safe Disposal of Contaminated Sacks

Exposure of workers to toxic dusts can occur while paper sacks are being opened and during subsequent handling involved in disposal. For example, in one operation litharge was dumped and then the empty sacks were piled high in the worker's arms and carried to the rear of the plant where they were burned in a 55-gallon drum. Lead fumes from this operation were observed entering the open plant windows, and a large puddle of lead was later found in the burned-out drum. A unique control system was evolved by integrating the operation of the hood, the exhaust ventilation, and a gas-fired incinerator. The hood exhaust runs horizontally a short distance and has a conveyor belt on the bottom. The empty sacks are placed on the conveyor and fed into the incinerator. The incinerator flue acts as the exhaust duct for the hood.

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Piperidine—A Hazardous Chemical

On August 17, 1964, a chemical operator engaged in transferring piperidine under room-temperature conditions received unexpectedly severe chemical burns when the material sprayed from the drum. First-degree burns of the face, left ear, and neck, second-degree burns of the forearms and abdomen, and third-degree burns of the chest developed even though less than 3 minutes elapsed before the man was under a safety shower and his clothes were removed. This was the first such incident of skin contact of any significant extent to come to our attention during a period of more than 20 years' production and use of piperidine. Past experience and available references (*Industrial Hygiene and Toxicology*, F. A. Patty, Vol. II, 2nd ed., Inter-

science Publishers, New York, 1962) did not suggest the magnitude of the contact hazard. However, consideration of the strongly alkaline nature (pK at 25°C=2.80; $K=1.6 \times 10^{-3}$) and potent solvent properties of this material would indicate severe corrosive necrotic action on the skin to an extent greater than "strong primary irritant." On the basis of this unfortunate incident, a recommendation to classify piperidine as a hazardous chemical is considered justified.

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A Rapid High-Efficiency Extraction Technique

The estimation of benzene-soluble organic contaminants in air is normally done by collection on a glass fiber filter, a portion of which is subsequently extracted with a Soxhlet apparatus. Extraction time can be materially reduced with the apparatus shown in Figure 1, which utilizes the principle of vapor phase degreasing combined with reflux washing. The pictured apparatus features a unitized assembly with specially designed spring-loaded supports. The sample filter is folded on itself to contain particulates, rolled into a tight cylinder, and slipped into a 16-mm x 60-mm paper extraction thimble which is placed in the reflux column as shown. Boiling benzene vapors envelop the sample and proceed upward to the condenser. The condensate flows downward through the three-way stopcock and is discharged onto the sample. The sample is thus continually washed with freshly distilled solvent while remaining in contact with hot solvent vapor. The drip-tip of the condenser prevents return of condensate down the vapor bypass. On completion of the extraction, the stopcock is rotated 120° to distill excess solvent for re-use. When only a few milliliters of solvent remain, the boiling flask is removed and heated under an infrared lamp for a few minutes while a stream of ambient air is gently aspirated through the flask to accelerate drying.

The efficiency of this apparatus was checked by extraction of known weights of mineral oil (from 0.05 to 1.00 gm, pharmaceutical grade) randomly scattered on the filter. Recoveries for both 1-hour and ½-hour extractions averaged 99.7%. Recovery data for actual loadings of gasoline engine exhaust fumes indicate that treatment by the vapor-reflux method for 20 minutes gives essentially 100% extraction of benzene-soluble particulates, whereas 3 hours of Soxhlet extraction was required for comparable results. A further advantage lies in the fact that it is not necessary to filter the extract to remove particulates, thus offering a saving in time and an increase in accuracy,

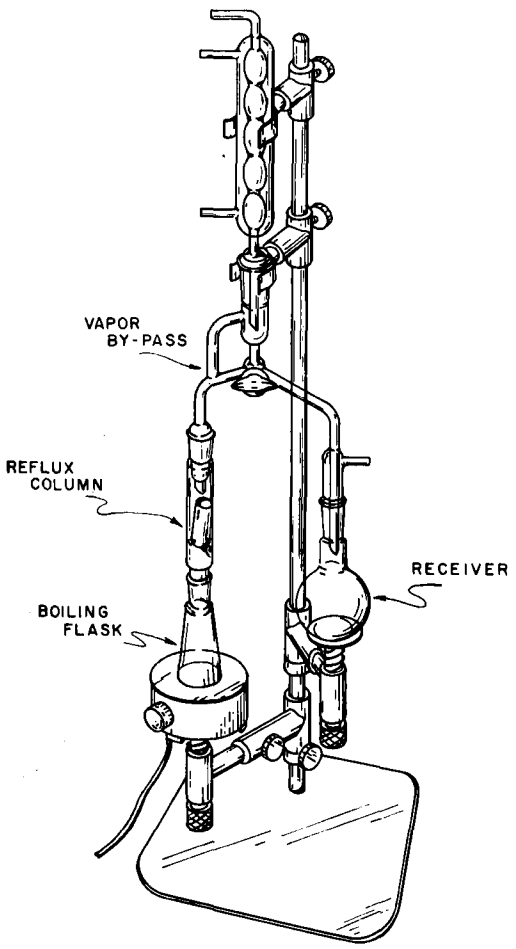

FIGURE 1. Apparatus for solvent (benzene) extraction of organic contaminants.

since filtration loses are precluded. The volume of solvent required is only 25 ml, virtually 90% of which is recovered in pure form for re-use. (*Note:* This investigation was supported in part by the Clico Laboratory Supply Company, 901 North 21st Avenue, Phoenix, Arizona, which has been awarded an exclusive license for the manufacture and sale of this apparatus under U. S. Patent Application Serial Number 318,281 with further patents pending.)

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