

ABSTRACT

FACTORS AFFECTING THE YIELDS AND PROPERTIES OF THE
PRODUCTS OF THE LOW-TEMPERATURE CARBONIZATION OF
PENN-LEE COALS FROM SOUTHWESTERN VIRGINIA

by

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ABSTRACT

The purpose of this investigation was to study the factors affecting the low-temperature carbonization of seam number one, Penn-Lee coal from southwestern Virginia, by determining the effect of pretreatment of the charge, temperature of the retorting gas, and time of retorting on the yields and properties of the products of carbonization.

After an examination of the literature pertinent to the investigation, a pilot-scale carbonization unit was constructed. The construction of the unit consisted partly of the modification of an existing fluidization unit. Various auxiliary apparatus were also added to the modified unit for more satisfactory operation.

A series of bench-scale tests were performed to study the effect of pretreatment conditions on the free-swelling index, the weight loss, and the volatile matter in Penn-Lee coal. Time and temperature had a significant effect upon the free-swelling index. Temperature of pretreatment had a significant effect on the weight loss during pretreatment. Time and the

time by temperature effect were found to be significant with regard to the volatile matter remaining in the coal after pretreatment. Also, the decomposition point of Penn-Lee coal was found to lie between 427 and 454 °C (800 and 850 °F).

Twelve pilot-scale tests were performed to study the effect of carbonizing conditions on the products of carbonization. The pretreatment time had a significant effect upon the dry tar yield, the tar viscosity, the tar specific gravity, and the twenty per cent tar distillation temperature. The time of carbonization had a significant effect upon the gas yield.

None of the variables studied showed a significant effect within the range studied, upon the volatile matter in the char product, the bulk density of the char, or the calorific value of the char.