<u>SYNOPSIS</u>

Breaking of coal from a face in seam, the most important operation in underground coal mines has been the major subject of concern to mining engineers. Of the several methods, the one which attracted most attention during and since the World War II is extraction by ploughing or planing the coal off the face. Where seam conditions permit, this method has several advantages over the method of coal getting by use of cutter loaders.

The Coal India Ltd. has been, for sometime, contemplating to introduce coal ploughs in suitable seams in Indian mines not only to introduce a new mining technique in the Indian Mining Industry but also to utilize the potentialities of ploughs in increasing the country's coal production. Except for the physicomechanical properties and some strength indices of coals, there is no other reliable yardstick adopted in the country with which to measure the relative ploughability of seams. The present study, therefore, has been undertaken with a view to develop a laboratory method for assessment of the ploughability of five prospective seams suggested by the Central Mine Planning and Design Institute, Ranchi. A hydraulically-operated planing or grooving apparatus has been designed and fabricated in the Department of Mining Engineering, Indian Institute of Technology, Kharagpur, to carry out scientific studies in the laboratory on coal samples obtained from the mines working the prospective seams.

As the influence of the bit parameters had been the subject of investigation by several research workers in the past, for the present study chisel-shaped bits with a fixed bit geometry (45° rake angle, 6° clearance angle, and 3° side clearance angle) have been used in the planing tests.

A hydraulic circuit with a hydraulic accumulator has been designed to give uniform cutting speeds up to 0.65 m/s. The cutting and normal forces were measured by a specially designed octagonal dynamometer in conjunction with a storage oscilloscope fitted with a camera.

Coal samples were collected from the seams and embedded in cement mortar to form blocks with projecting coal faces which could be held rigidly on to a concrete pillar by means of clamps.

A stall rig has been designed to control the movement of planing bit in both horizontal and vertical planes so that grooves of different depths can be cut at different horizons on the coal sample face. Tests were conducted on the sample blocks and the data analyzed to determine the following :

- Variation of the cutting force, normal force and specific cutting force with depth and width of cut and speed of cutting.
- The influence of the depth, and width of cut and cutting speed on the power consumption, production of fines (<1mm) and new surface area generated.
- Relation between the power consumption and the fines produced, new surface area generated, and the quantity of coal produced.
- 4) The effect of blunting of bits on cutting force, normal force, power consumption, and production of fines.
- 5) Relation between the physico-mechanical properties of coal and the cutting force.
- The effect of the relative bit distance on the cutting force with parallel cuts.

Mathematical relationships have been deduced between the above parameters. An attempt has also been made to classify the five seams from the point of view of ploughability/workability from the data obtained from the tests.