A large number of parameters must be controlled when a technological process has been introduced in modern oil refineries.

Since the number of instruments is large and it is quite difficult to read all indications at the same time, the operator of the unit has great difficulty in getting the required information in due time.

This holds first of all for pilot units, especially for those pilot units in oil refineries and petrochemical plants which were built for studying and testing technological processes and for obtaining data needed in the design and construction of novel units or for improvement of existing semi-industrial and industrial units. These units have special features which must be taken into account in choosing measuring instruments and automation devices.

The main aim of pilot units is to bring forward the most important features of the process examined and simultaneously to yield the needed reliable information on all parts of the unit, so that the regularities of the process examined can be found from evaluation and examination of the information.

Production in pilot units is characterized by frequent alterations of the technological regimes and changes in the units themselves.

Several important properties of the process, some of which must be controlled if the process is to be automated, are found and determined accurately only during the test runs.

Since pilot units are often operated in nonstationary regimes and the technological characteristics are insufficiently stable here, automation of these units presents considerable technical difficulties.

During tests in a pilot unit and studies on processes in semi-industrial and industrial units, the readings of the secondary and local instruments are usually taken and entered in the log book at given intervals.

However, these records lose much of their value because the readings of the separate instruments are taken at different moments and because operators taking the readings from the recording or indicating instruments are liable to make subjective errors.

Centralized data logging and evaluation of the information by means of an automatic digital (ADR) recorder is now finding ever wider application; this makes it possible considerably to improve the quality of the experiments and the evaluation of the results.

Nowadays several centralized control computers suitable for digital recording of data are manufactured in series [1, 2]. However, since these computers show substantial shortcomings, it is not always possible to employ them extensively in the oil refining and petrochemical industries, with the result that not all advantages of automatic centralized control and digital recording of the results can be utilized [3]. Such shortcomings are:

a) The computers are not sufficiently reliable because they contain a large number of gas-discharge and vacuum tubes, contacts, and junctions and also because an automatic system controlling the correct operation of computer and its elements has not yet been developed;

b) the computers are unsuited for production units because the control rooms of most pilot units are usually built close to the technological apparatus so that they are exposed to draughts from open doors and windows, and to vibrations of floor and walls.
Fig. 1. Diagram showing the connections to the digital recorder and the system controlling and adjusting the operation of a pilot unit for catalytic cracking. Apparatus: R-1) reactor; R-2) regenerator; K-1) rectification column; F-1) furnace heating the supply; F-2) furnace delivering the steam used in steaming the catalyst; F-3) furnace in which the air used in regenerating the catalyst is heated; B-1) catalyst bunker; T-1) partial condenser. Instruments: 1) local; 2) in the panel; 2a) meters and pneumatic converters; 3) connection box; 4) digital "Korall" recorder. Flows: 1) feed; II) fresh catalyst; III) steam; IV) air; V) regenerated catalyst; VI) catalyst covered with coke; VII) cracked products; VIII) stack gases.

For this reason it is very interesting to check whether the novel digital recorders can be used for centralized control of the operation of pilot units and for studying technological processes.

One step in this investigation was to install a digital "Korall" recorder [4] and to test its operation in a pilot unit used for catalytic cracking with a pulverized catalyst.

As is well known, catalytic cracking comprises three related continuous operations: cracking of the starting material, regeneration of the catalyst, and separation of the cracked products.

Figure 1 shows a diagram of the unit in which catalytic cracking is carried out in a fluid bed and which is provided with an automatic digital recorder. The equipment of the unit is mounted in a frame with five attendance platforms. The process is controlled from the second platform on which the operation panels and the main control panel are placed.

The main operation parameters of the pilot unit are: amount of feed supplied 15-20 liter/h, specific mass flow rate 0.5-22 h⁻¹, amount of catalyst circulated 100-200 kg/h, weight ratio of catalyst recycled 4-15.

To get reliable and stable characteristics, the following main parameters of the unit were stabilized: 1) the supply of starting material to the reactor; 2) the circulation rate of the catalyst; 3) the temperatures of the furnaces, the reactor, the regenerator, and the rectification column.