

INDUSTRIAL DATA PROCESSING APPLICATIONS REPORT

Applications Hot Saw Control
Type of Industry Iron and Steel
Name of User Shelton Iron and Steel
Stoke-on-Trent, England

Equipment Used English Electric-Leo-Marconi KDN2 Computer System

Synopsis

An English Electric-Leo-Marconi KDN2 Computer System is being used at the Etruria North Works of Shelton Iron and Steel, Ltd., at Stoke-on-Trent, England.

The computer system controls the cutting of rolled beams and sections at two hot saws. The rolled steel is cut to customer specifications, and in order to achieve an acceptable yield from a particular section or beam, the orders must be sorted into combinations producing the optimum use of the beam.

In addition to increasing production, there has been a significant higher yield at the saws.

At the new Etruria North Works of Shelton Iron and Steel, Ltd., Stoke-on-Trent, England, rolled beams and sections are cut to customer lengths under the control of a real-time computer system.

The hot saw computer is part of the complete system supplied by English Electric for the new mill.

The mill area comprises twin reheating furnaces, three-stand universal beam and section mill, twin hot saws and primary and secondary cooling beds. During planning of the new mill it became apparent that a special production problem existed in the area of the hot saws and cooling beds.

The rolled steel is cut at the saws directly into lengths ordered by various customers. To achieve an acceptable yield in this sawing process, the various lengths ordered by the customers must be sorted into combinations which best suit the total length of rolled beam or section. In practice, however, the lengths of successive rolled beams or sections vary and cannot be predicted. Consequently, it is impossible to choose the optimum combination of customer lengths to be cut from each beam or section until it has actually been rolled. The time available in which to choose this combination is, therefore, extremely short. In this mill the task is particularly arduous since the sawman has to choose suitable combinations of customer lengths for two saws cutting simultaneously.

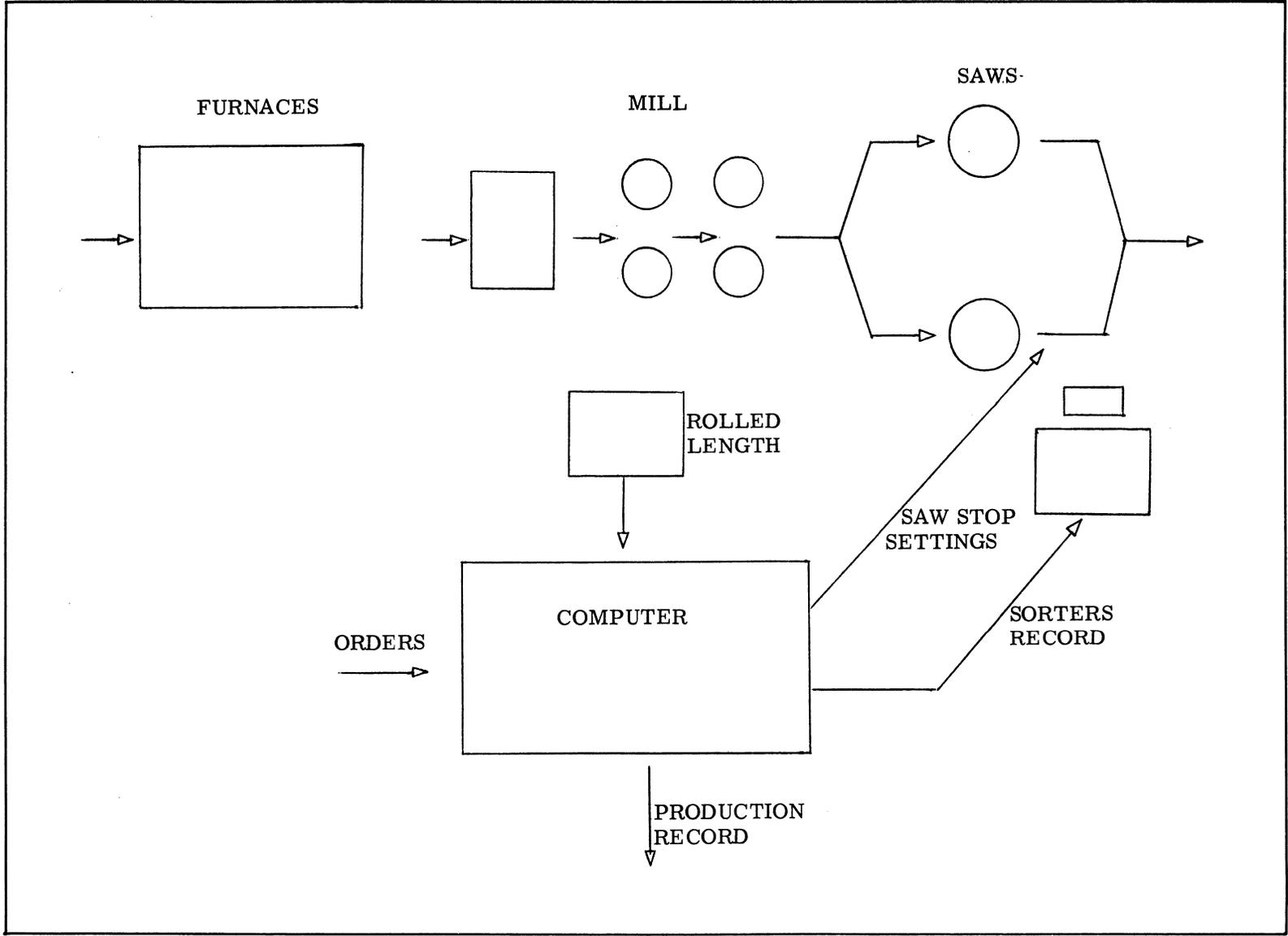
After careful study it was decided that this task could be performed best by a real-time computer system.

THE SYSTEM

The prime task of the computer system is to control the cutting of rolled beams and sections at the two hot saws. In addition, the system tracks the cast numbers of individual blooms as they move through the reheating furnaces and mills.

The saw control function is best explained by following the actual cutting process. The overall operation is supervised by the sawman from his cabin mid-way between the finishing mill and saws. As each rolled beam or section arrives at the saw, its length is observed by the sawman via a closed circuit television channel. He then signals this information to the computer by means of switches on his control desk. Two television cameras are necessary because either of them may at any time be obstructed by the overhead traveling crane.

The computer already holds in its core storage details of an appropriate number of different customer orders for this particular type of section. As soon as it receives the length information from the sawman, the computer proceeds to calculate an optimum combination of customer orders to fit the length of rolled material now available for sawing. The correct positioning of the rolled steel prior to each saw cut is achieved by means of movable stop arms. The stop arms at each saw are mounted on a motor-driven carriage, fitted with an automatic position control directly linked to the computer.

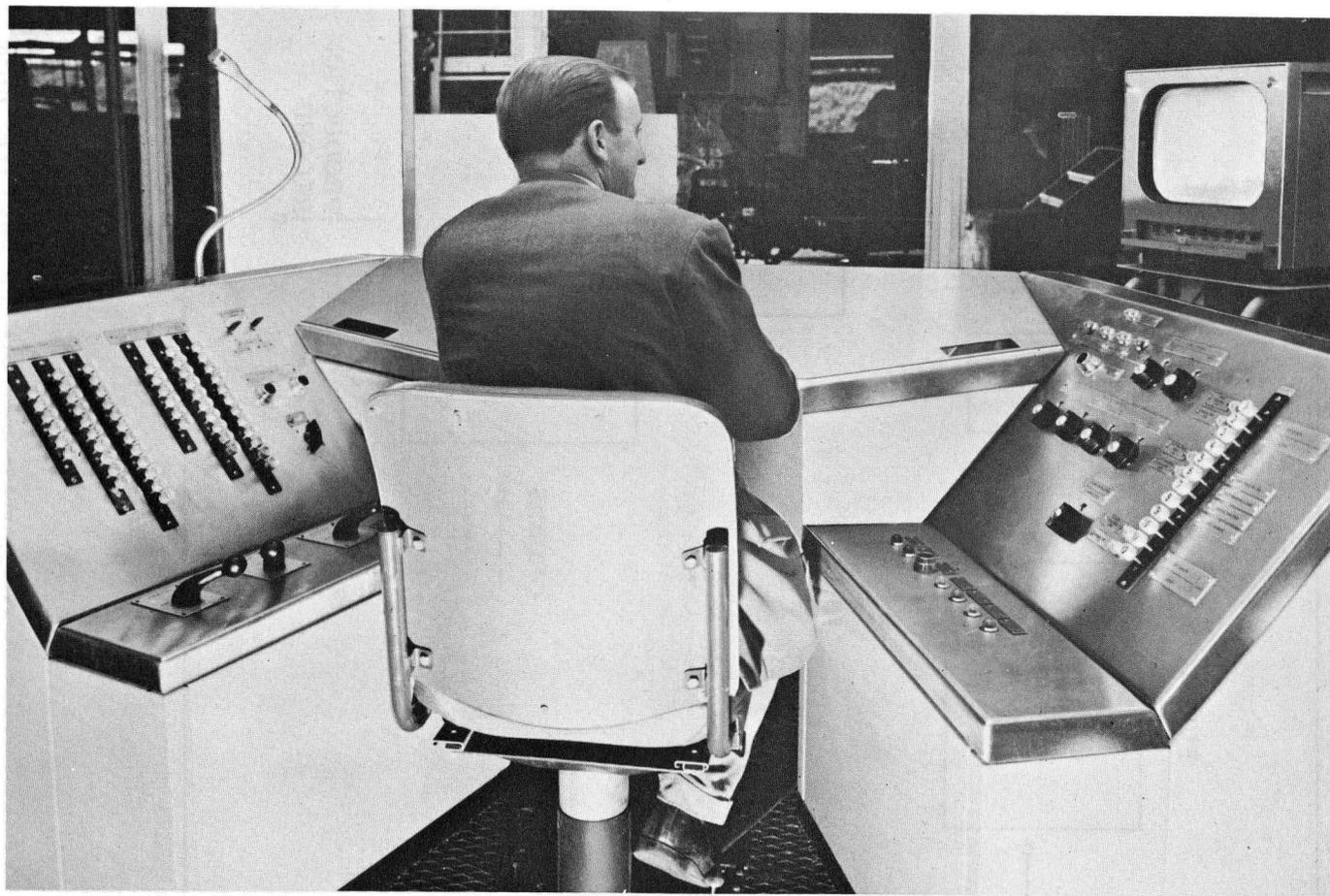


COMPUTER SYSTEM AT SHELTON IRON AND STEEL.

By this means, the setting and positioning of the appropriate stop arm and the recording of the lengths actually cut are entirely controlled by the computer system. The operator at each saw is thus only required to operate the roller tables and to initiate each saw cut.

The computer system prints out details of each cut segment on teleprinters at the cooling beds. This printed information is used by the cooling bed checkers to identify accurately each cut length. This is a vital function as the cut lengths are sorted into customer groups as they pass on to the secondary cooling beds.

The details of the various customer orders scheduled for a particular shift are presented to the computer on punched paper tapes compiled by the production planning department. As production proceeds the computer punches out a record tape that is subsequently passed back to the production planning department.



SAWMAN AT CONTROL DESK.

Equipment

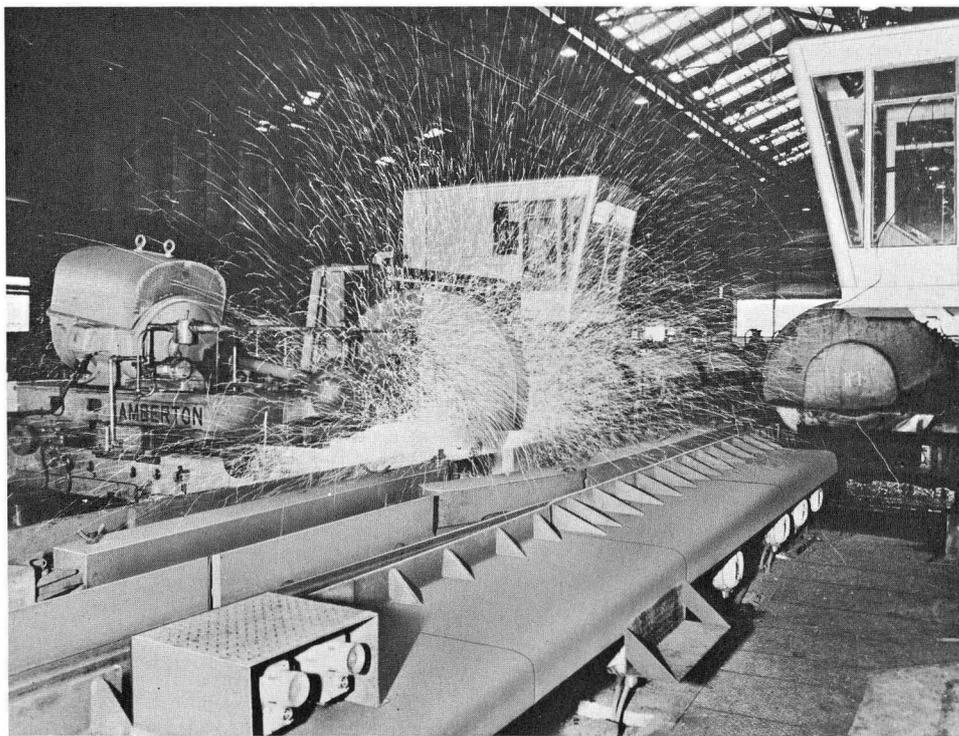
The heart of the system is an English Electric-Leo-Marconi KDN2 computer. This is a stored program digital computer specifically designed for industrial control applications. The standard computer is linked to the various control panels by means of a custom built input-output unit.

Comprehensive monitoring facilities are built into the equipment and each operator's control panel is constructed to suit his particular operational requirements. In some cases the panels are integrated with the conventional mill control desks, while in others a separate desk or wall-mounted control box is provided.

Communication between the operators and the computer vitally affects the performance of the system. Whenever an operator sets a message into the computer from his control panel, various signal lamps tell him whether the message has been accepted by the computer, or alternatively rejected because it is inaccurate.

In addition to the English Electric-Leo-Marconi KDN2 computer, paper tape readers are used to feed orders into the computer, teleprinters are used to record the lengths of steel as they are cut, paper tape punches are used to record production and a Friden Flexowriter is used for simultaneous preparation of paper tapes and also the typewritten order schedule.

The system also uses closed circuit television cameras with remote control.



TWO HOT
SAWS UNDER
COMPUTER
CONTROL.

In addition to controlling the saws, the computer tracks the cast numbers of individual blooms as they pass through the reheating furnaces and mills to the cooling beds.

As each batch of blooms is loaded into the reheating furnaces, its cast number is set into the computer from a special control desk situated at the entry of the furnaces. Within its memory store the computer maintains separate lists of cast numbers corresponding to blooms in various parts of the furnaces and mills. As each bloom arrives, rolled and cut to length, on the cooling beds, the appropriate cast number is displayed on digital indicators to the cooling bed stampers. The display numerals are approximately three inches high and can easily be seen by the stampers. When a change of cast number occurs, a warning blast is given on a Klaxon connected to the computer.

The computer system thus takes over the task of a conventional paperwork system and provides a sound basis for improving the accuracy of cast tracking.

RESULTS

The computer system has been successfully operating for over a year. The most obvious benefit of the system is a significantly higher yield at the saws.

In addition, the system permits a faster production rate since it would not be possible for one sawman to optimize the cutting at the two saws simultaneously. Finally, the information handling functions performed by the system assist greatly in the correct identification and working of stock at the cooling beds.

Shelton Iron and Steel is presently investigating the problems involved in linking the KDN2 computer to a larger ICT 1300 computer at its main office. All orders would then be stored on the magnetic tape storage of the ICT computer and passed directly to the KDN2 computer as required, thus eliminating all intermediate processing and paperwork.