

the components; machines attach them to the printed circuit boards; machines make the parts; machines assemble them. Once the components are fed into the machine, for example, complete radio sets can be produced; and on one body radio assembly line, turning out 1,000 radios a day, two workers now produce more than what 200 workers did with the old methods.

In the U.S.S.R., a fully automatic plant makes aluminium pistons for heavy truck engines. No human hands intervene throughout the process and even waste metal is removed from machines automatically.

In the United States automobile industry, the non-automated engine plant has almost died out for all practical purposes. At the Ford Plant in Cleveland, for instance, one man runs a transfer machine performing more than 500 machine operations, whereas conventional methods required 35 to 70 men. Formerly, 400 workers took 40 minutes to turn out one engine block; now, under automated methods, 48 workers complete a block in less than half that time.

Automation is also applied in fertiliser plants, in the handling of bulk materials, and in the "continuous flow" industries—oil refining and piping, chemicals (including atomic processing), plastics, paint, beverages, rubber, flour-milling, cement, electric power, telegraphs and telephones, sheet steel and steel castings, and tanning. A modern oil refinery is almost completely automatic; the few workers in the plant are there to watch the instruments only.

All these developments and many others pouring into the main stream of technological change are transforming the whole process of industrial production and call for a redefinition of skill. The classical concepts of unskilled, semi-skilled and skilled workers, largely taken over from a static mediæval society of guilds, no longer corresponds to the needs of the dynamic, fast-changing industrial society of today. The skill of one technological era is dead and the skill of a new era is just emerging.

As automation develops, the character of work in industry will also change beyond recognition and the need for skilled workers, technicians and engineers is likely to expand considerably. Young people will need better and longer basic schooling. A greater percentage of the popula-

tion will attend universities and technological institutes and vocational training facilities will have to be expanded and, most important, functionally reoriented.

But while technological changes will create new opportunities they will also raise new problems in the labour and social field. They are likely, for instance, to accentuate some of the problems of transition to industrialisation, particularly in countries with chronic under-employment and heavy population pressure. Yet past experience has shown that most of the industries which have gone the furthest with advanced mechanisation and automation have been those in which employment has been expanded considerably.

Technological progress holds out great savings in labour which may be taken in the form of: (1) higher output, (2) shorter hours, (3) unemployment, or a combination of the three. The problem is therefore to arrive at a satisfactory combination of the first two to avoid the third.

This requires careful advance planning on the part of management, with full consideration of the human problems of technological changeovers; full consultation of workers and their representatives before plans are finalised; careful timing; and proper safeguards to prevent or minimise displacements and individual hardship.

As far as the impact on salaries is concerned, there is widespread agreement that technological progress will lead, in the future as in the past, to an increase in wages. In other words, higher productivity should result in better pay. If its benefits are distributed equitably to all sections of the population, it should also lead to a general lowering of the price of consumer goods.

By way of summing up, one might say that automation and other technological developments are bound to accentuate the long-term trend towards higher pay and shorter working hours, but there is a danger that, in some instances, they may create specific transitional problems. While there is no cause for alarm, both management and labour must renew their efforts and co-operate in planning, introducing and carrying through technological changes in the best interests of all sections of the community.

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try of Education and Scientific Research in addition to his duties as Director-General, Scientific and Industrial Research.