

## ON MEASURING TECHNOLOGICAL CHANGE IN CEMENT INDUSTRY IN INDIA

I. C. ARYA

The growth of output of an industrial unit takes place apart from that occurring due to input factors. These types of changes in output take place due to technological change. This kind of study was originally made by M. Abramoviz<sup>1</sup> who has explained growth of output in U.S. economy. Some writers term it as a residual<sup>2</sup> growth (A) that also includes growth due to technical change.

Murray Brown classified technical changes into neutral and non-neutral<sup>3</sup>. A neutral change does not affect factors of production i.e., labour or capital but it causes a shift in the production function without altering the marginal rate of substitution of labour for capital. A non-neutral change alters the production relation. It can be either labour saving (capital using) or capital saving (labour using). If the production function changes such that the marginal product of capital rises relative to marginal product of labour, then it would be known as capital using technical change and vice versa. Similarly, a labour using technical change takes place when marginal rate of substitution of labour for capital is lowered at every combination of labour and capital. Thus changes in the efficiency of technology and returns to scale are termed as neutral technical change while non-neutral technological change takes place when there is some change in capital intensity and in the ease of substitution of capital for labour.

### *The solow<sup>4</sup> Measure of Technical Change*

Solow has devised to measure technical change by specifying a simultaneous equation system. He has used production function approach by taking the assumptions that (i) the production function is of Cobb-Douglas type, (ii) the

- 
1. M. Abramoviz, "Resource and output Trends in the United States Since 1870," *Papers and Proceedings of the American Economic Association*, Vol. 46, (May 1956), pp. 5-23.
  2. Domar, E.D., "On the Measurement of Technological Change," *The Economic Journal*, December 1961, p. 709.
  3. Brown Marray, *On the Theory and Measurement of Technological Change*, Cambridge University Press, 1966, pp. 20-21.
  4. Solow R. M., "Technical Change and Aggregate Production Function *The Review of Economics and Statistics*, Vol.39, August 1957, pp 302-30.