

CHAPTER 2

The United Kingdom weighing and measuring industry

2.1. The General Electric Company Limited (GEC) is a large group of companies predominantly connected with the manufacture of electrical and electronic products. Averys Limited (Averys) is mainly concerned with the manufacture, selling and servicing of weighing and measuring equipment. Most of the issues dealt with in our report concern the effects of a merger of the two companies on Averys' business. We therefore begin this report with a description of that part of the weighing and measuring industry with which Averys is concerned.

Law

2.2. The principal legislation affecting weighing or measuring equipment is contained in the Weights and Measures Acts 1963, 1976 and 1979. Under that legislation weighing or measuring equipment in use for trade must be individually 'passed' by the authorities and must normally bear a stamp indicating that this has been done. Trade is defined for this purpose in section 9(1) of the Weights and Measures Act of 1963, and the stamping requirement in section 11(2).

Government supervision in weights and measures

2.3. Weights and measures administration in central government is vested in the Department of Trade which has the responsibility for:

- (a) maintaining national measurement standards for the trading parameters (eg length, mass, capacity) and providing a nationwide calibration service in order to give credibility and authority to national measurement standards in use for trade;
- (b) specifying measurement standards and testing equipment and thereby ensuring appropriate levels of accuracy in local government weights and measures offices;
- (c) ensuring, by a system of design assessment and certification, that designs of weighing or measuring equipment are suitable for use for trade; this entails consideration of such features as inherent accuracy, inherent reliability and freedom from accidental or deliberate mis-operation; and
- (d) formulating and representing the Government's views on legal metrology.

2.4. Weights and measures administration in local government is vested with the Trading Standards Departments of the local authorities who have responsibility for:

- (a) maintaining standards and testing equipment in their localities;
- (b) verifying initially and inspecting subsequently equipment in use for trade; and
- (c) enforcing the law.

There are 89 local authorities who employ some 1,400 qualified Inspectors of Weights and Measures.

Types of weighing or measuring equipment

2.5. The main types of equipment used for trade are listed below and are described more fully in paragraphs 2.6 to 2.13:

(a) Non-automatic weighing machines

- Beamscales
- Precision balances
- Retail weighing machines (including those with price-computing facilities)
- Platform weighing machines
- Weighbridges
- Crane weighing machines

(b) Automatic weighing machines

- Beltweighers
- Filling machines

(c) Liquid measuring instruments

- Petrol pumps and associated equipment
- Bulk flow meter measuring systems

Such equipment is not always used for trade and when it is not, it will not need to be passed and stamped. Examples are weighing machines used solely in manufacturing industry. Certain other equipment used for approximate weighing, such as household scales, does not need to be passed as it is not used for trade.

2.6. The three main classes of weighing and measuring equipment are described below. Within each of these three classes machines may be operated by traditional mechanical means, electro-mechanically or electronically, but all electronic machines contain some mechanical element. Electronic machines may incorporate micro-processors and load cells (see paragraphs 2.18–19) in the determination of weight or volume.

Non-automatic weighing machines

2.7. This class covers the widest range of instruments. The most familiar group within it are counter machines ranging from the traditional street market two-pan scale, through the many variations of the self-indicating weighing machine with mechanical indexing and optical projection display systems to the modern price-computing instrument employing electronic techniques to generate, process and display in digital and/or ticket form not only the measured quantity, but also the price-to-pay against a pre-selected unit price.

2.8. Machines with larger capacity in this class include the platform weighing machine and its several variants; such machines are to be found in industrial organisations, food processing plants and wholesale premises, and are used for weighing individual items and material in bulk. The principles and techniques employed are similar to those used in the lower capacity counter machines, although they are not likely to have a price-computing capability. Other examples are the airport baggage weigher and the livestock weighing machine.

2.9. Of still larger capacity in this class is the weighbridge which can have a capacity of up to several hundred tonnes. Weighbridges are most frequently used for the static or in-motion weighing of road vehicles and railwagons and these types have capacities up to some 60 tonnes. They may use either large capacity load cells or a lever arm system to reduce the force exerted by the load on the weighing platform to a value sufficiently small to operate the indicating mechanism.

2.10. Other non-automatic weighing machines in trade use are the precision balances used in buying and selling bullion and in trading in precious stones.

Automatic weighing machines

2.11. An automatic weighing machine functions without the need of an operator, except to start the automatic process. Such machines are used in industrial organisations, processing plants and product packaging units where material handling and weighing are complementary operations.

2.12. There are three main types of automatic weighing machines:

- (a) *Continuous totalising machine.* Such a machine, referred to as a 'belt-weigher', determines the mass of material in bulk as it moves continuously over a weighing element. Applications are typically the loading or unloading of ships and the conveying of coal from pithead to nearby generating station.
- (b) *Discontinuous totalising machine.* This type of machine weighs material in bulk by filling, weighing and discharging a series of hoppers; each weighing operation is separate, although the product flow is continuous in the system.
- (c) *Gravimetric filling machine.* This type of machine weighs and discharges automatically a predetermined load into a bag, sack or packet; it is used extensively in the pre-packing of products. Familiar examples are bags of sugar, sacks of flour, packets of potato crisps. Rapid filling of containers with a predetermined quantity entails a fast feed to within a lower range limit followed by a final dribble feed to bring the quantity to within the permitted tolerance.

Liquid measuring instruments

2.13. Of the various measuring instruments dispensing liquids, the most familiar and the most relevant to this inquiry is the petrol pump. The term is something of a misnomer as the measuring instrument which stands on the garage forecourt nowadays is more than the original manually-operated plunger moving in a cylinder and displacing a known volume for each completed stroke. The modern instrument comprises:

- an electrically driven pump
- an air separator
- a rotary piston meter
- a computing and display unit
- a nozzle control

together with the necessary control valves to ensure correct functioning. After the single stroke pump there was developed an instrument with the clock face pump registering quantity only, then an instrument with a mechanical price-computing unit and rotating drum indicators registering quantity and price-to-pay, and finally the electronic instrument. Self-service operation is widespread and this has encouraged the development of kiosk control equipment.

Development of the industry

2.14. The need for weighing machines and instruments for measuring is as old as trade itself. In the United Kingdom a stimulus to new development arose about the turn of the century from legislation requiring weighing machines used for trade to be passed and stamped. The early years of this century brought development of self-indicating scales and of weighbridges. Until recent years weighing was carried out mechanically and the production of machines was a skilled and specialised engineering operation. This remains true for mechanical scales and, to ensure accuracy is maintained, regular checking and servicing of such scales is essential. The quality and speed of response to emergency calls for repairs is also important. The quality of these services where provided by the manufacturer may influence the customers' choice of product. These services are not, however, carried out exclusively by the supplier of the machine; it is possible to have machines serviced by other manufacturers or by independent specialists in this work.

Metrication

2.15. The change to metrication of weighing equipment used by the industrial sector in the United Kingdom is almost completed, but it has not started in the retail trade where there are larger numbers of instruments to convert or replace. Government proposals to introduce a programme of metrication for the retail trade were withdrawn, and at present there are no firm proposals on the matter.

Harmonisation

2.16. The Department of Trade told us that in November 1973 the EEC Council of Ministers adopted a Directive 'on the approximation of the laws of the Member States relating to non-automatic weighing machines'. The purpose of this Directive was to remove barriers to trade in these products within the EEC by providing for the single approval of patterns and the initial verification of 'production items'. It was uncertain when the Directive would be implemented in the United Kingdom and in the meantime United Kingdom existing law and regulations continued to apply.

Electronic developments

2.17. Since the early 1950s important developments in the application of electronics to weighing machines have included the introduction of load cells, integrated circuit techniques and, more recently, microprocessors.

2.18. A load cell is a transducer for converting a force into an electrical signal. It consists basically of a steel billet with strain gauges bonded to it. When the billet is deformed by an applied force, the electrical resistance of each of the strain gauges changes and alters the small output voltage of the

associated circuitry. The load cell is a key unit in the electronic weighing machine as it enables the physical force caused by the mass being weighed to be converted into an electrical signal, so enabling electronic techniques to be employed in processing and displaying the weight and other necessary information such as the price in the case of a price-computing weighing machine of the kind increasingly being used on the counters of many shops. The majority of electronic weighing machines use load cells.

2.19. A microprocessor is a device which provides, in one or more silicon chips, the circuits and functions which would be found in the central processing unit of a computer. It interprets and executes instructions and usually incorporates arithmetic capabilities, yet may be no larger than a quarter of an inch square.

2.20. Any product or process involving elements of measurement, control or data processing is now a potential candidate for the use of microprocessors. By their use the processing power of a major computer can be crammed on to devices so small—and at a cost so low—as to have been unthinkable only a few years ago. Consequently, measurement control or data-processing facilities can now be introduced more cheaply and compactly. Use is already widespread in products of the weighing and measuring industry, such as shop scales showing weight, price per pound and price-to-pay, weighbridges capable of weighing the individual wagons of a moving train at speeds of five miles per hour or more, and self-service petrol pumps linked to kiosks where payment is made. In large retail businesses weighing with associated labelling and packaging may take place in stock rooms linked to central stock control. In manufacturing industry the use of automatic weighing or measuring of ingredients and their controlled entry into processes could greatly increase.

The United Kingdom industry and markets

2.21. Official statistics (Minimum List Heading 339.5 of the 1968 Standard Industrial Classification) record that in 1978 United Kingdom production of scales and weighing machinery in establishments employing at least 25 persons amounted to £50.3 million (Averys suggests that 1.5–2.0 per cent needs to be added to this value to account for the smaller manufacturers). The domestic market (production minus exports plus imports) amounted to £42.1 million in the same year. These figures include all machines, whether or not they need to be passed and stamped, including some kinds which Averys does not produce, such as household scales. Averys has, however, informed us that the weighing machine market in which it competes accounts for over half, by value, of the domestic weighing machine market as a whole, so that the official figures are relevant even when Averys' own narrower market is being considered.

2.22. The tables in Appendix 1 give figures for 1975 to 1978, uncorrected for inflation, for production, imports and exports, and the size of the domestic market as well as certain key performance ratios based on these figures, for the United Kingdom weighing machine industry. The tables also indicate major sources of imports to, and destinations of exports from, the United Kingdom, as well as a comparison of performance of the United Kingdom industry with those of certain other leading producing countries in major regional markets.

2.23. Production of weighing machines in the United Kingdom has risen 36 per cent by value since 1975, while the United Kingdom market has grown

substantially faster (48 per cent). Penetration of the home market by imports increased from 22.5 per cent in 1975 to 26.8 per cent in 1978, the whole of the increase taking place in the last two years. Imports grew faster than exports, both proportionately and in absolute terms, over the three-year period. The largest source of imports is West Germany, which increased its share of total imports from 22 per cent in 1975 to 42 per cent in 1978. Other important sources are the Irish Republic, Sweden and the USA. One-quarter of United Kingdom exports goes to the EEC, the Irish Republic taking a substantial proportion of this. Other important single markets are Australia, South Africa and Iraq.

2.24. Exports of weighing machines exceed imports though the value of this excess has probably declined in real terms in recent years. However, the official statistics almost certainly underestimate the size of the excess in the kind of products made by Averys. A recent change in the method of presentation of official trade statistics has made it possible, for 1978 only, to calculate the trade balance excluding household and baby scales. When these scales are excluded the recorded excess of exports over imports increases from £8.2 million to £9.2 million because imports of household and baby scales exceed exports of such items¹. However, similar calculations are not possible for earlier years, so that we cannot tell whether the trend for weighing machines other than household and baby scales is similar to that for the whole industry.

2.25. The predominant manufacturer of weighing machines in the United Kingdom is the Averys Group, whose overall turnover, worldwide, was £107 million in 1978, mostly related to the selling and servicing of weighing machinery of various kinds, though it also included other products, notably petrol metering equipment, testing machinery and furniture. About one-third of Averys' total turnover consists of new weighing machinery, produced in the United Kingdom. Almost all of Averys' weighing products are produced to an accuracy that makes them eligible for official stamping whether or not this is legally required. Averys estimates that it has 60-70 per cent by value of the United Kingdom market for such machines² and about 35-40 per cent of the whole market covered by MLH 339.5, a large proportion of which, however, consists of types of weighing machine that Averys does not make (see paragraph 2.21). The next largest United Kingdom manufacturer has a turnover in weighing machines much less than half that of Averys. However, there are a considerable number of much smaller manufacturers who supply only particular segments of the market or, in some cases, particular geographical areas. A number of relatively small manufacturers are subsidiaries of much larger foreign manufacturing firms.

¹We are unable to tell whether exclusion of household and baby scales would affect our estimate of import penetration of the United Kingdom home market for weighing machinery. Such exclusion would tend to reduce the estimated import penetration if the ratio of imports of kitchen and baby scales to total weighing machinery imports (19 per cent in 1978) exceeded the ratio of the home market for kitchen and baby scales to the home market for all weighing machinery. Unfortunately we have no estimate of the latter ratio except that it is something under 45 per cent. (Averys says that the market at which it aims accounts for about 55 per cent of the total weighing market, as defined by Minimum List Heading 339.5. However, the remaining 45 per cent includes an unknown proportion of machines for approximate weighing in addition to household and baby scales.)

²Difficulties of defining what kind of machinery made by other manufacturers should be included in Averys' market, of estimating the output of very small firms whose small size disqualifies them from inclusion in official statistics, and of adjusting official and company trade statistics to a common valuation basis, make greater precision difficult.