Coremaking practice throughout the World has changed very rapidly during the past decade and continuous developments make a complete appraisal impractical. This advancement in the field of coremaking has been basically in the materials used, with modifications to equipment to obtain the advantages of the new process techniques. These new materials, processes and equipment have changed the skills required in the ‘core shop’ and influenced the design and layout of this foundry department.

A core is a part of a mould which, because it forms the internal shape or an undercut external section of a casting, eg, a section that cannot be withdrawn from the mould without breaking the contour, is produced as a separate sand shape. These separate sand shapes are formed by compacting a specially formulated sand mixture in a core-box. The sand mixture used must exhibit the following properties:

1. It must be capable of supporting itself after the forming operation; it must not sag or distort; it must be capable of holding its shape on a contoured carrier until hardened. This property is called ‘green strength’. Green strength is aided during the forming process by the use of core irons. These are specially formed pieces of cast-iron or steel rod designed by the coremaker to facilitate supporting the ‘green’ core, or lifting of the dried core during the assembly of large and complex mould units.

2. The hardening is achieved by baking in an oven or by chemically hardening. The hardened core material must develop sufficient strength to permit handling and to resist the pressure of the molten metal; these properties are defined as ‘dry strength’ and ‘hot strength’.

3. The sand formulation used must not produce excessive gas upon contact with the molten metal. The degree of sensitivity to gas varies from metal to metal. To aid the removal of the gas evolved from the core binder, the base sand used in coremaking has a higher permeability than...
moulding sand. The coremaker introduces into the sand mass artificial vents of wax wire, nylon, polystyrene, perforated metal tubes and, in large cores, burnt coke. The artificial vents are connected to a common outlet, usually located in a coreprint formed in the mould. The moulder, when preparing the mould for pouring, connects these vents to the outside of the moulding box and, subsequently, the atmosphere.

4. Another very important property the core must have is that of collapsibility; it must not resist the contraction of the casting during cooling or it will crack the casting. The core must also be easily removed from the casting after solidification; lack of bond control can result in costly core removal. The property of collapsibility or breakdown is particularly important in the manufacture of such castings as cylinders containing water jackets, complex valve bodies containing intricate port design, fused sand in this type of passage way can result in serious dressing shop problems and the loss of castings.

Figs. 1, 2 and 3 show a casting such as that mentioned—a complex pump casing. Fig. 1 shows the cores being assembled in the mould, the centre volute section being enclosed by a water jacket. Note the lifting or support irons being used to lower the core into position; the core will be sealed before closing the mould. Figs. 2 and 3 show different views of the finished casting. The cavity in the end of the centre core in Fig. 1 is the main vent outlet for the escape of the core gas.

The core is located in the mould by coreprints; a study of Fig. 1 will reveal the internal cores being positioned in support units in the outer moulds or cores. A coreprint is an extension of the pattern, painted a distinctive colour for identification and designed to locate and support the core during the casting operation. The shape and style of the print used varies according to casting design; certain coreprints have to be used to balance the core in the mould, others are extended to the joint line to permit withdrawal from the sand.

It is essential that the core and print are an accurate matching fit or liquid metal will enter the gap between the core and print and seal the gas vent behind the coreprint, resulting in 'blown' castings.

SANDS FOR COREMAKING

The bulk of sands used for coremaking processes are siliceous. The use of olivine, zircon and chromite sands have been investigated by various sections of the casting