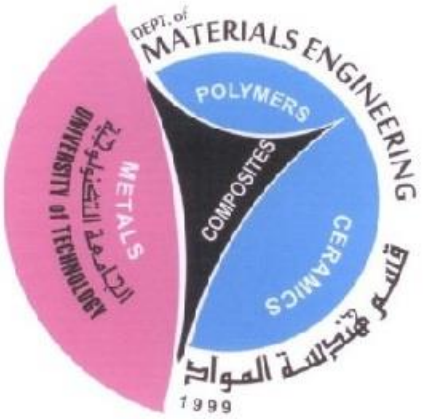


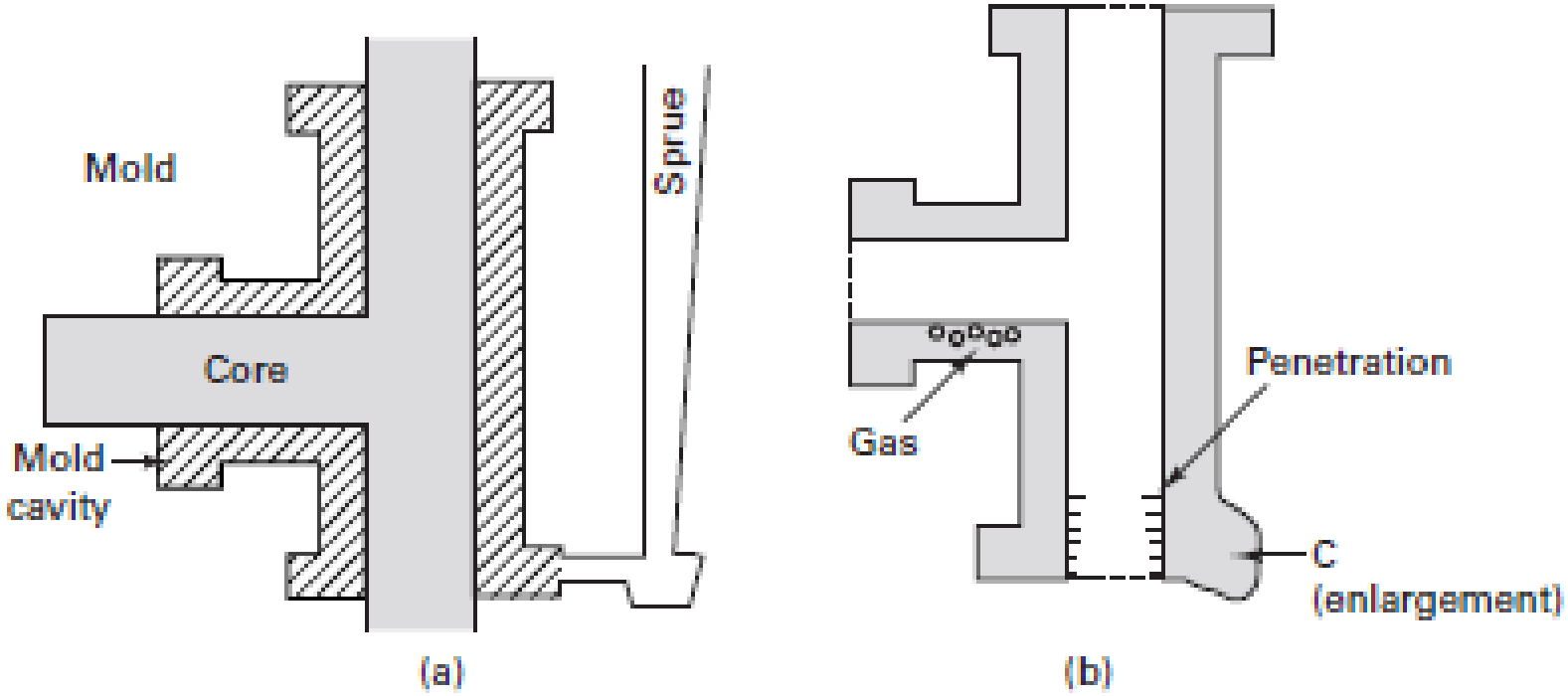
University of Technology
Materials Engineering Department
General Materials Branch

Casting Technology I

Fourth Class

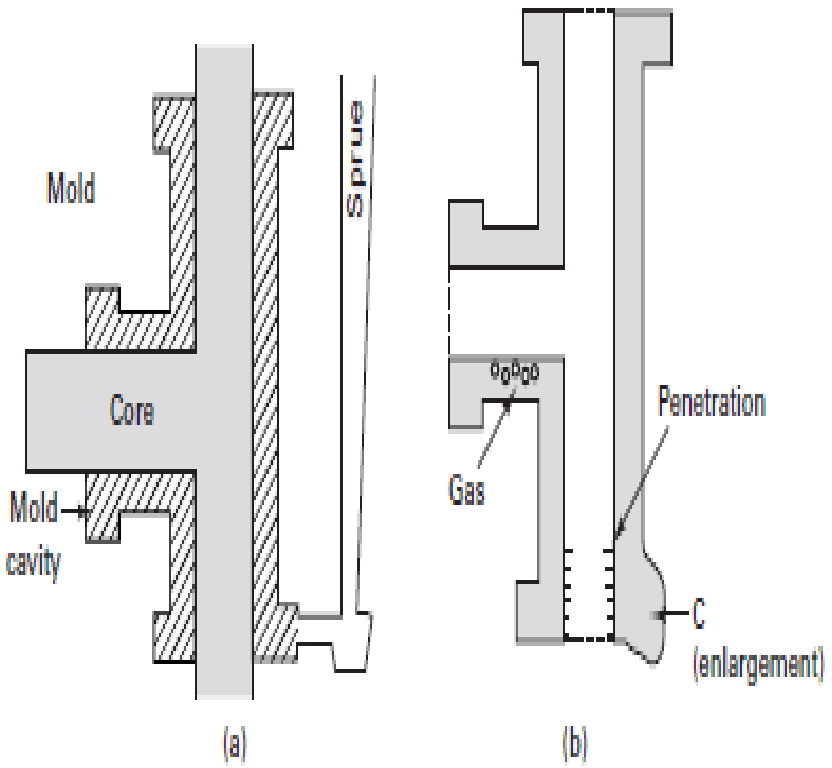
Lecture 10: Case Studies in Casting

Case study in Casting
The Cast Oil-Field Fitting



The Cast Oil-Field Fitting

cast iron, T-type fitting is being produced for the oil drilling industry, using an air-set or no-bake sand for both the mold and the core. A silica sand has been used in combination with a catalyzed alkyd-oil/urethane binder. The figure shows a cross section of the mold with the core in place (a) and a cross section of the finished casting (b).The final casting contains several significant defects. Gas bubbles are observed in the bottom section of the horizontal. A penetration defect is observed near the bottom of the inside diameter, and there is an enlargement of the casting at location C.



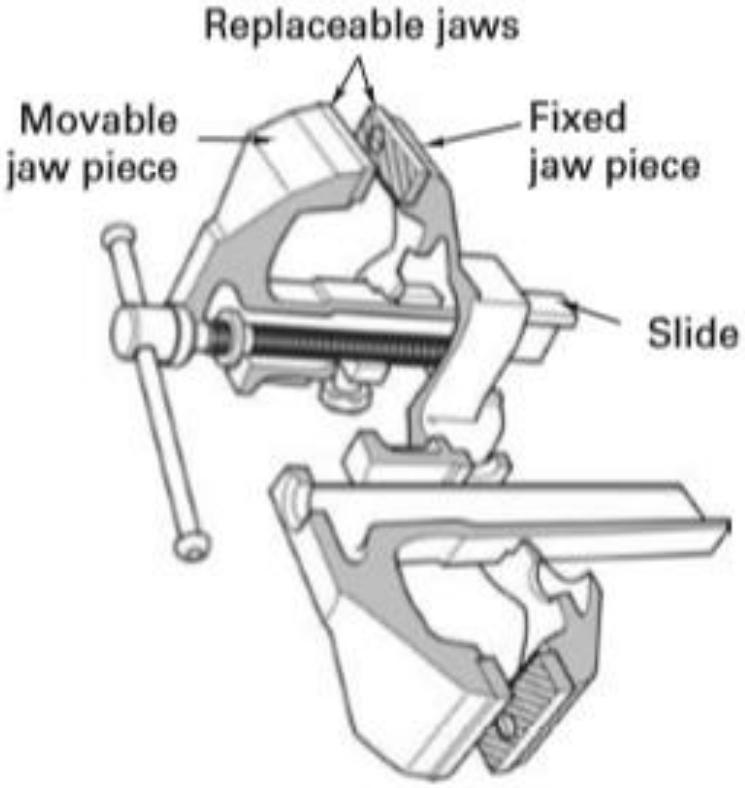
Questions for Discussion

1. What is the most likely source of the gas bubbles? Why are they present only at the location noted? What might you recommend as a solution?
2. What factors may have caused the penetration defect? Why is the defect present on the inside of the casting but not on the outside? Why is the defect near the bottom of the casting but not near the top?

Questions for Discussion

3. What factors led to the enlargement of the casting at point C? What would you recommend to correct this problem?
4. Another producer has noted penetration defects on all surfaces of his castings, both interior and exterior. What would be some possible causes? What could you recommend as possible cures?
5. Could these molds and cores be reclaimed (i.e., recycled) after breakout? Discuss

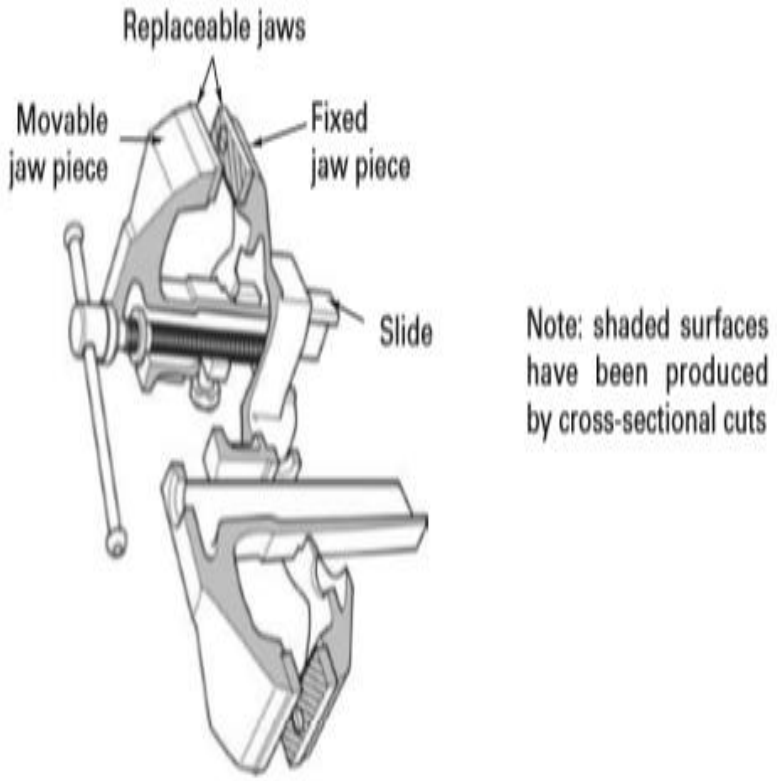
Case Study (2)
Movable and Fixed Jaw Pieces for a Heavy-Duty Bench Vise



Note: shaded surfaces have been produced by cross-sectional cuts

Movable and Fixed Jaw Pieces for a Heavy-Duty Bench Vise

- The figure presents a cutaway sketch of the movable and fixed jaw pieces of a heavy-duty vise that might see use in vocational schools, factories, and machine shops. The vise is intended to have a rated maximum clamping force of 15 tons. The slide of the moving jaw has been designed to be a 2-in. box channel. The jaw width is 5 in., the maximum jaw opening is 6 in., and the depth of the throat is 4 in. The designer has elected to use replaceable, serrated jaws and suggests that the material used for the receiving jaw pieces have a yield strength in excess of 35 ksi, with at least 15% elongation in a uniaxial tensile test (to ensure that an overload or hammer impact would not produce brittle fracture



Questions for Discussion

1. Determine some possible combinations of material and process that could fabricate the desired shapes with the required properties. Of the alternatives presented, which would you prefer and why?
2. Would the components require some form of subsequent heat treatment? Consider the possibilities of stress relief, homogenization, or the establishment of desired final properties. What would you recommend ?
3. One of your colleagues has suggested that the slides be finished with a coat of paint. Do you think a surface treatment is necessary or desirable for your selected material and process? If so, what would you recommend? If not, defend your recommendation?