

**Tomato Ketchup  
Production**

It takes 35'000 gallons of water to grow a ton of tomatoes, and about 1700 gallons to process a ton and over two pounds of farm-delivered tomatoes to make a 14 ounce bottle of ketchup. The process requires a substantial capital investment and thousands of plant employees as modern canneries are very large, using as many as 250 tons of tomatoes per hour, or a truck and trailer load each six minutes.

The manufacture of ketchup begins in the spring of each year when food processors contract with growers. In the latter part of June or early July tomatoes are ripe and ready for picking. Harvesting is most often done today by machines manned by agricultural workers who discard extraneous materials as the vines are pulled from the ground and the tomatoes are shaken onto conveyor belts. Sorted tomatoes are loaded into large bulk trucks which then haul the tomatoes from the fields through a grading station where inspection takes place and then to the food processing plant. Immediately upon receipt at a cannery, the tomatoes are dumped from the bulk trucks, thoroughly washed and conveyed by water flumes to elevators which deliver them to sort tables where they are again inspected and separated for various products.

Tomatoes selected for ketchup are fed by conveyor to a disintegrator, or chopper, where heat is immediately applied to bring the tomato pulp to a temperature just under boiling. This heating step is called "hot breaking" and is a method of applying sufficient heat in a very short time to preserve the pectin by stopping enzymic action. Hot breaking not only contributes to improved case yields, making more bottles of ketchup for each ton processed but also provides insured quality and longer shelf life. The heated tomato pulp is pumped to large boiling kettles where it is cooked to the proper consistency and where spices and condiments are added. The cooked ketchup is then pumped through a screening process of pulpers and finishers which remove the peel and seeds. After this process the ketchup flows by gravity to a deaerator where air is removed from the product, further protecting the ketchup from color and flavor degradation. Deaerating also provides a uniform product which is necessary for correct fill weight control. The ketchup is then pumped to a bottle filler and capper and then moved by conveyor to a washing station where the bottles are washed, cooled and air dried prior to labeling. Machines place the neck and body labels on each bottle and the bottles are automatically put into cases and palletized. Pallets are then loaded onto trucks which are pulled by a tug either to the warehouse for storage or directly to trucks or rail cars for shipment to the processors or the customers distribution warehouses located throughout the United States.

During the entire process, quality control personnel make constant checks at each step to assure that the finished product, its ingredients and its packaging meet the high standards for quality that American consumers associate with their food products. Sanitation crews clean equipment before, during and after manufacture, assuring the consumer of wholesome conditions which meet both the manufacturer's and the various state agencies requirements for cleanliness. Involved also in the manufacture of a single bottle of ketchup are hundreds of people engaged in departments for the growing, trucking, receiving, preparation, cooking, canning, filling, labeling, casing, warehousing, sanitation, safety, maintenance, technical, supervisory and administrative efforts necessary to bring this all about.

In addition to the obvious labor, capital and product costs, the consumer may not think of the energy costs involved. The shortage of natural gas and fuel oil and the attendant quadrupling of those costs over the past several years, has necessitated heavy capital investment on the part of food processors to absorb the majority of these costs and to reduce the amount of energy required by more efficient use. In California the water shortage has driven costs higher as farmers seek the most productive use of their land. Canneries, responding to the increased costs for both water and sewage, have made heavy capital investments to reduce usage by reuse of water, typically some three times in an average U.S. cannery, and as high as eight times, thus reducing costs and more efficiently using this scarce natural resource.