

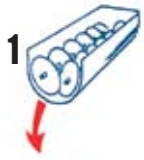
THE REFINING PROCESS

The raw sugar arrives by ship at the Chelsea Sugar Refinery. It is unloaded into the raw sugar store. Controlled amounts of sugar are released on to conveyor belts which go into the the main refinery.



Student Copymaster

1 The Melt House



1. **The Mixing Station:** The raw sugar is mixed with hot sugar syrup to soften the outside layer of the sugar crystals.



2. **Centrifugals:** These work rather like a spin dryer. When the raw sugar/syrup is spun at high speed, the syrup and impurities are forced out through holes in the basket, and the sugar crystals stay behind.



3. **Melting Tank:** The washed raw sugar crystals are dissolved in hot water to form a liquid called 'sugar liquor'. This is an amber colour.



4. **Carbonation Tanks:** Lime (milk of lime) is added to the sugar liquor, and carbon dioxide gas is bubbled through it. The lime and carbon dioxide form a chalk, and impurities such as small pieces of cane and fibre cling to it.



5. **Filter Station:** The sugar liquor is pumped through a series of flat and circular filter cloths. All impurities and the chalk are kept to one side, while the liquor is forced to the other side.

The Char and Pan House



6. **Char Cisterns:** To remove the amber colour of the sugar liquor, it is passed through large metal tanks containing bone charcoal. The charcoal is washed frequently and placed in kilns to burn off the impurities and colouring — then it is re-used.



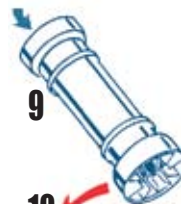
7. **Vacuum Pans:** The sugar liquor is now clear, and is boiled in vacuum pans until sugar crystals of the right size are formed. The air at the top of the pan is pumped out to create a vacuum. This (partial) vacuum means that the liquid will boil at a lower temperature. The operator can see the sugar crystals being formed through special microscopes in the side of the pan. When the crystals are the right size, the heat is turned off and the mixture of sugar and crystals is dropped into holding tanks.



8. **Refined Sugar Centrifugals:** Here, the sugar crystals are separated from the syrup. The syrup is either returned to the pans for making more crystals, or used to produce brown sugar, golden syrup or treacle. The sugar crystals pass into tumbler driers.



Grading and Packaging



9. **Tumbler Driers:** The sugar crystals pass into tumbler driers. These dry the damp crystals as they tumble through the hot air.



10. **Silo:** All the white sugar is stored in the silos which can hold up to 800 tonnes of white sugar.



11. **Packaging:** The graded sugar crystals are packed by fully automatic, high-speed machines into different-sized packs, both in paper and in plastic bags.



12. **Warehouses:** The packaged sugar is carried away by conveyors to a large warehouse to be packed onto pallets for distribution.



13. **Transport:** The sugar on the pallets can be transported by truck or loaded on to containers for rail or ship travel throughout New Zealand or for other countries around the Pacific.

