REFINING REVISITED

BY

SAJID HUSSAIN NAQVI

ABSTRACT

THE TECHNOLOGY OF SUGAR REFINING IN PAKISTAN HAS BEEN REVIEWED AND COMPARED WITH THE TECHNOLOGY IN AUSTRALIA AND OTHER COUNTRIES AROUND THE WORLD.

THE OBJECTIVE IS TO HIGH LIGHT AREAS WHERE IT CAN BE MODEFIED TO IMPROVE THE EFFECIENCY AND/OR REDUCE THE CONSUMPTION OF CHEMICALS.

INTRODUCTION

TECHNOLOGY OF SUGAR REFINING, BEING USED IN OUR SUGAR MILLS, TODAY, IS THE SAME AS IT WAS INTRODUCED

IN THE EIGHTEES, WHEN THE REFINING WAS FIRST INTRODUCED IN THE COUNTRY.

NO CHANGE OR MODIFICATION HAS BEEN MADE OR ADOPTED EITHER IN THE MELT CLARIFICATION OR THE SUGAR

BOILING, SINCE THEN.

CURRENT PRACTICE IN PAKISTAN

* PRODUCING RAW SUGAR BY DOUBLE MAGMA BOILING.
* MELTING ONLY THE A SUGAR.
* CLARIFICATION OF THE MELT BY TALOFLOC OR CARBONATION PROCESS, ALTHOUGH TALOFLOC IS MORE COMMON.
* FILTERATION IS DONE THROUGH DEEP BED FILTERS
* FURTHER FILTERATION THROUGH ETON FILTERS BY THE FACTORIES PRODUCING BOTTLERS GRADE / SPECIAL SUGAR.
* SOME FACTORIES DO NOT USE ANY FILTERATION AT ALL.
* MIXED BOILING WHICH MEANS THAT FINE LIQUOR IS ADDED TO ALL THE BOILINGS (R 1, R2 & R3 ETC) TO IMPROVE THE COLOR OF SUGAR.
* AN INTERMEDIATE BOILING IS ALSO DONE BETWEEN THE REFINE BOILINGS AND THE RAW BOILINGS. IT IS USALLAY CALLED A1 BOILING.
* SUGAR FROM DIFFERENT BOILINGS IS BAGGED AND KEPT SAPARTAETLY ACCORDING TO MARKET REQUIREMENTS.

OTHER COUNTRIES

* BOTH A & B SUGARS ARE CONSIDERED AS RAW SUGAR AND ARE MELTED.
* FIRST STEP IS AFFINATION IN WHICH RAW SUGAR IS MADE IN TO MAGMA AND CENTRIFUGED.
* THIS IMPROVES THE COLOR AND REDUCES IMPURITIES
* CLARIFICATION IS DONE BY PHOSPHATATION OR CARNONATION PROCESS, JUST LIKE US, BUT WITH OUT ANY DECOLORISER.
* FILTERAION THROUGH DEEP BED FILTERS IN CASE OF PHOSPATATION OR PRESSURE FILTERS IN CASE OF CARBONATION
* IT IS CLAIMED THAT ABOUT 30% COLOR IS REMOVED.
* FURTHER DECOLOURISATION IS DONE BY PASSING THROUGH CARBON COLOUMNS.
* FINAL FILTERATION IS DONE THROUGH POLISHING FILTERS JUST LIKE OUR ETON FILTERS.
* IT IS CLAIMED THAT FINE LIQUOR OF ABOUT 150 ICUMSA IS OBTAINED.
* 10 STRIGHT BOILING IS THE PRACTICE, WHICH MEANS THAT FINE MELT IS NOT FED IN TO R2 or R3 BOILINGS.
* SUGAR OBTAINED FROM DIFFERENT BOILINGS IS MIXED TO OBTAIN FINAL SUGAR OF DESIRED COLOR.
* TYPICAL BOILING SCHEME IS SHOWN AS FIG 2.
* IT IS CLAIMED THAT 100 % BOTTLERS SUGAR IS PRODUCED.

MAIN DIFFRENCES

* AS SEEN FROM THE ABOVE, MAIN DIFFRENCES ARE IN THE FOLLOWING AREAS.
* A-RAW SUGAR BOILING,
* B- AFFINATION.
* C- REFINERY BOILING.

WE WILL DISCUSS THEM ONE BY ONE

RAW SUGAR BOILING

* DOUBLE MAGMA BOILING SCHEME WAS INTRODUCED IN PAKISTAN BY MR. T.W. TONG AT CRESCENT SUGAR MILLS AROUND, 1966-67.
* AIM WAS TO IMPROVE THE COLOR OF WHITE SUGAR, WHICH WAS A BIG CHALLENGE AT THAT TIME.
* THIS PRACTICE HAS CONTINUED SINCE THEN ALTHOUGH IT HAS SOME SERIOUS DISADVANTAGES.
* INCREASES CIRCULATION OF SUGAR WHICH NEEDS HIGHER CAPACITIES AT PANS AND CENTRIFUGAL STATION.
* INCREASES THE PURITIES IN THE BOILING HOUSE, WHICH INCREASES THE PURITY OF FINAL MOLASSES.

AFFINATION

* MAKING RAW SUGAR MAGMA AND CENTRIFUGING IS CALLED AFFINATION
* IT REMOVES COLOUR AND OTHER IMPURITIES ADHEREING TO THE RAW SUGAR CRYSTALS BEFORE IT ENTERS THE REFINERY.
* IT REDUCES LOAD ON THE REFINERY THEREFORE, IS A STANDARD FIRST STEP IN ALL THE SUGAR REFINERIES ROUND THE WORLD.
* IN AUSTRALIA RAW SUGAR OF ABOUT 2000 ICUMSA IS SUPPLIED TO THE REFINERY. AFTER AFFINATION IT IS REDUCED TO ABOUT 800 ICUMSA WHICH IS CONSIDERED AS STANDARD.
* IF THE COLOR OF RAW SUGAR IS ALREADY 800 ICUMSA AFFINATION IS NOT REQUIRED.
* IN PAKISTAN COLOUR OF RAW SUGAR RANGES BETWEEN 1200 to 1500 ICUMSA. BUT AFFINATION IS NOT IN PRACTICE.
* RUSLTING IN HIGH DOSAGES OF DECOLORISER.

REFINERY BOILING

* STRIGHT BOILING IS FOLLOWED WHICH MEANS THAT FINE MELT IS USED ONLY IN R1 BOILING
* R 2 IS BOILED ON RO 1 AND SEED MAGMA.
* R 3 IS BOILED ON RO 2 AND SEED MAGMA ETC.
* COLOUR OF PRODUCT SUGAR IS MANAGED BY MIXING SUGARS FROM DIFFERENT BOILINGGS IN A SCREW CONVAYOR.
* THIS SYTEM WAS ALSO SUPPLIED IN ABOUT 1980 AT KAMALIA SUGAR MILLS WHICH WAS DESIGNED BY TATE & LYLE.
* THIS SYSTEM AT KAMALIA WAS DISCARDED BECAUSE SUGAR LOST ITS LUSTER DUE TO RUBBING ACTION IN THE CONVAYOR.
* A FLOW CHART FROM UNITED REFINRY IRAQ SUPPLIED BY MR. KHALID HANEEF SHOWS THAT THEY ARE MIXING WET SUGAR INSTEAD OF DRY SUGAR.
* I THINK THAT SOLVES THE PROBLEM LUSTER IN SUGAR.

EFFECIENCY OF PHOSPHATATION PROCESS

* AS SEEN ABOVE COLOUR REMOVAL IN PHOSPHATATION PROCESS WITH OUT ANY DECOLORISER IS ABOUT 30%.
* IN PAKISTAN, SOMETIMES TOTAL COLOUR REMOVAL ALONG WITH THE DECOLORISER IS AROUND 40-45%.
* THEREFORE, PHOSPHATATION PROCESS WITH OUT DECOLORISER SHOULD BE CHECKED BEFORE THE START OF THE SEASON FOR ANY POSSIBLE DESIGN OR MAINTENANCE FAULT IN THE EQUIPMENT.

INNOVATIONS

* AT THIS STAGE I WILL LIKE TO MENTION INNOVATIONS IN SOME COUNTRIES WHICH ARE NOT PART OF THE MAINSTREAM REFINERY PROCESS.
* CHINA.
* RUSSIA.
* BRAZIL.

CHINA

* IN CHINA, SOMETIMES SO2 IS USED IN PLACE OF AIR IN THE PHOSPHATATION FLOATATION PROCESS
* ADVANTAGE IS REDUCED CONSUMPTION OF DECOLORISER.
* DISADVANTAGE IS INCREASE IN SO2 CONTENT OF THE SUGAR
* BEST THING IS THE FLEXIBILITY OF THE SYSTEM.YOU CAN STOP/ADJUST THE QUANTITY OF SO2 AT ANY TIME AS PER REQUIREMENT.

RUSSIA

* IN RUSSIA SOMETIMES REFINING IS DONE IN BEET SUGAR PLANTS AS SUCH.
* DETAILS ARE NOT AVAILABLE BUT IT IS KNOWN THAT THEY PRODUCE MARKETABLE SUGAR FROM THESE PLANTS.

BRAZIL

* IN BRAZIL EXPERIMENTS ARE UNDERWAY AND PAPERS\* ARE BEING PUBLISHED ABOUT THE USE OF STONG OXIDISING AGENTS LIKE A MIXTURE OF HYDROGEN PER OXIDE AND SODIUM CHLORITE IN THE RAW SUGAR MELTER.
* COLOR REMOVAL IS CLAIMED TO BE ABOUT 70 %.
* IT IS ALSO CLAIMED THAT THE MIXTURE HAS BENEFITS AS BIOCIDE.

THANK YOU