

CHAPTER 1

INTRODUCTION

The production of beer involves the blending of the extracts of malt, hops and sugar with water, followed by its subsequent fermentation with yeast. The brewing industry employs a number of batch-type operations in processing raw materials to the final beer product. In the process, large quantities of water are used for the production of beer itself, as well as for washing, cleaning and sterilising of various units after each batch is completed. A large amount of this water is discharged to the drains.

For many years the brewing industry has recorded high ratios of water used to beer produced. This can be as high as 10:1 in sites with large smallpack production, and as low as 5:1 on some traditional brewing sites (Crispin, 1996). The main water usage areas of a typical brewery are brewhouse, cellars, packaging hall and general water use. Water use attributed to these areas includes all water used in the product, vessel washing, general washing and cleaning in place (CIP); which are of considerable importance both in terms of water intake and effluent produced.

With rising water prices and ever increasing competitiveness within the marketplace, the importance of raw material costs, including water, in determining product costs and profitability should not be ignored. The minimisation of water costs should be given a high priority since it is an area where the consumption (and generation in the case of effluent) is directly under the control of the brewery site (Barnard and Alexander, 1996).

Over the last three decades many papers dealing with all aspects of malt, hops, sugar and yeast can be sourced. However, very little technical literature relates to the minimisation of water used on a brewery site. Since breweries are understanding the necessity of managing water utilised by their relevant sites, a detailed water management investigation, orientated towards those processes producing waste and effluent, needs to be undertaken. This will enable a thorough assessment of the steps that can be introduced to minimise waste volumes and strengths, and hence effluent treatment requirements. Detailed factory investigations are often costly exercises, although the costs are recovered many fold by savings in raw water, raw materials, water treatment and/or effluent treatment costs (Barnard and Alexander, 1996).

In this thesis a detailed water management investigation will be conducted on the Rosslyn brewery site. Information regarding the assessment of water management in the various brewing sections will be sourced from :

- literature,
- plant trials,
- historic analysis,
- supplier documentation and consultation and
- personal communication.

In Chapter 2, a literature survey outlining the brewing and packaging process will be addressed. The theoretical development in Chapter 2 forms the framework for development of mass balances presented in Chapter 3 to 6, which will address the following:

- water usage in the brewhouse (Chapter 3),
- water usage in the cellars (Chapter 4),
- water usage in the packaging hall (Chapter 5),
- general water usage (Chapter 6), and
- overall consolidated water balance (Chapter 6).

Finally, in Chapter 7 conclusions and recommendations based on this water management investigation are given to optimise present operations at the plant.