

SHADES OF GREEN, LEVELS OF SUSTAINABILITY IN BREWERY DESIGN

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ABSTRACT

This presentation comments on the benefits of Greenfield brewery projects, from an integrated design perspective, where one tries to benefit from opportunities in certain geographic or site specific locations. It also addresses local situations, challenges and opportunities, since a large portion of overall costs of a project are a direct consequence of location. Included in this paper are projects that every brewery can research and possibly implement, to improve their economic bottom line.

Keywords: *Greenfield, energy saving, location*

INTRODUCTION

1. Advantages of Greenfield Designs

The current benefits moving to Greenfield operations vs. expanding or optimising existing operations centre mainly around energy consumption, water utilisation, raw material use (e.g. extract efficiency) and improved internal and overall logistics.

It is difficult to upgrade existing facilities while in operation and more importantly, the costly upgrades are never as efficient as new concepts or designs.

Given, for example, the current price increase for malt, new extract efficiencies through new milling and lautering technology create relevant savings. Cost savings were calculated on reduced malt consumption, on a Variomill only, for a 100000hl brewery to have a return on investment of less than 3 years, based on current malt and energy prices and taking into consideration the location and current milling technology of the brewery.

Energy savings are more complex, obviously process improvements such as new boiling technology, reducing evaporation rates to 3-4% are relevant, but losses (or savings) also need to be considered in piping systems, boiler technology etc. When looking towards energy savings, of importance is the ability to brew continuously, for example 3 days/wk with 8 to 10 brews/day instead of 5 days with 5 brews/day. Sizing the brewing sequence small enough not only gives a lot of flexibility towards brands but also allows for smaller, more efficient utility plants. Unfortunately some of these concepts are only possible in newly designed Greenfield breweries.

Lastly, is the issue of water, a precious resource wherever you are in the world, which has large cost consequences. To reduce the ratio hl water/hl beer produced in existing plants is difficult, however, it is possible to design a new brewery with ratio's between 2.5 and 4 to 5hl/hl beer produced, depending on the technology applied.

2. Costs of Greenfield Designs

It is always difficult to give an installed hl cost for a Greenfield project. The size of the brewery is an important factor since the hl cost is not a linear function of the size but there are benefits of scale.

However, the capital cost of building a brewery vs. the cost of owning and operating a brewery do not always follow the same lines. For example, if a brewery is operated under the designed capacity goals it could be extremely inefficient from an energy perspective. Again, it is important to size properly with multiple phases that allow growth, but are flexible enough to address ever changing realities for that location.

When considering new projects or if in the early planning phase of a project, the below **Table I** summarises the percentage cost of Greenfield projects and their key functions, based on those in which this Company has been involved.

1	Land and site development	8-12%
2	Buildings	28-38%
3	Brewing process	18-25%
4	Process utilities	6-9%
5	Packaging	20-23%
6	Logistics	3-5%
7	Design and Consulting	4-6%
8	Other	3-5%

There are huge differences in building costs, size of areas, designs required (e.g. hurricane and earthquake factors) and location. Therefore, these factors must be taken into consideration and applied individually to each situation.

3. Integrated Design

Integrated design is not really a new concept but it tries to look at the brewery design, not as a generic model that can be placed on any piece of land anywhere in the world, but to benefit from unique aspects of specific sites and locations.

If, for example, a possible site allows for anaerobic treatment of water in combination with some waste streams, that are valuable commodities (e.g. waste yeasts, spent grains, etc.), then up to 25 % of the thermal and electrical energy can be generated on site out of the waste stream, in combination with utility water and as such reduce the overall water consumption. However, integrated between the utility needs as well as the waste streams but now as a resource, an efficient, sustainable model can be created that will have large economic value.

Prior to the selection of the brewing and packaging equipment, it is very important to take a big picture approach and see where the organisation would be best located in relationship to the distribution, reception of raw materials and site utilities, *etc.* The reason for this is that in costing a Greenfield project, the equipment portion (brewing and packaging) represents between 38–45% of the overall project costs, depending on size and technology. The remaining 55% is heavily influenced by location.

Ultimately it is important beforehand to map out opportunities as well as challenges and geographic site where the brewery is to function, as these are very specific to the relevant brewery.