Production & Capacity Planning at the McGuinness & Co. Microbrewery

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Company Overview: McGuinness & Co. brewing company is one of the three largest microbreweries, or craft breweries, in Atlanta. According to the Institute of Brewing Studies (IBS), the term "microbrewery" designates a brewery that produces less than 15,000 barrels or 199,500 cases of beer annually. The company office and its 12,000 square feet production facility and warehouse are located in the Chattahoochee Industrial Park in the Collier Hills area. Currently, the brewery employs three full-time and two part-time employees, and occasionally hires other part-time help, when needed. McGuinness & Co. produces two regular beers – a pale ale, and a stout – and several seasonal beers – including a summer brew, a winter ale, and an Octoberfest lager. Last year, the company sold the equivalent of more than 9000 barrels of beer, bringing in annual sales totaling over $900,000.

Utilizing a limited number of brewing machines and equipment, McGuinness & Co. now distributes somewhere between 200 barrels of beer per week. The company resources include one milling machine, which cracks the grain, one mashing tun which converts the malt starch to sugar, and one brew kettle which boils and mixes the sweet wort liquid with hops. In addition to this machinery, the company also maintains three 40-barrel stainless still fermentation tanks, one filter tank, and a bottling station.

Current production difficulties: Due to sustained growth since its opening in 1995 the company currently experiences difficulties meeting its customer orders in a timely fashion. In the past, production of the different brews has been scheduled by the company owner, Mr. McGuinness, in a rather ad-hoc fashion, based on rough forecasting estimates of the expected demand. These forecasts combine an extrapolation of his previously experienced sales with his knowledge for potential fluctuations in demand trends in the craft brewery market. For example, in determining demand for the 1999 seasonal brew, Octoberfest, Mr. McGuinness used the demand data from the year before, 1998, and roughly estimated that the demand of this brew for 1998 would be about 20% higher. However, he believes that for year 2000, he would have to account for an even higher increase in demand, due to the shortage experienced by the vendors selling the seasonal McGuinness Octoberfest in 1999. It should be noticed that, due to the nature of the craft brewing industry, backorders cannot be tolerated, and the potential company inability to meet its customer orders might impair its market image, with an adverse effect on its future sales.

It follows that the company would be greatly benefited by the availability of a systematic methodology – preferably, implemented in a set of user-friendly computational tools – that will allow the prediction of future demand – in monthly and/or weekly intervals – taking into consideration historical sales growth trends, seasonal market fluctuations, and also any additional contingencies in demand, arising from the nature of the craft brewing industry. The importance of the availability of such a forecasting methodology / tool is further accentuated by the fact that the underlying fermentation times are fairly long. For instance, the fermentation time for the McGuinness Octoberfest, mentioned above, is in the order of 8-10 weeks. Hence, in order to meet experienced demand in a timely fashion, the company must predict its expected production needs early on, and act upon them in advance. On the other hand, notice that due to the perishable nature of the final product, the company policy is that no quantity should be consumed 4 months after its production, and therefore, no inventory is carried longer than this period.

This production planning is further complicated by the fact that the company must time-share the limited amount of its production resources to support the timely production of all the beers offered by it. This problem is particularly intense for the scheduling of the production activity at the fermentation process. As it was already mentioned, the company possesses three 40-barrel[1] fermenters that can be used for the production of any of the aforementioned five beers. The fermenting times of these beers in any of these fermenters is as follows: McGuinness Pale Ale, Winter Ale, and Summer Brew are fermented for two weeks, utilizing top fermenting yeast; the recently introduced Stout must be fermented for 3 weeks, while the Octoberfest lager is fermented for 8-10 weeks with a bottom fermenting yeast. Since the fermentation stage lasts significantly longer than any other step in the entire production process, it can concluded that it constitutes the bottleneck process in the production sequence, and therefore, it should be the main focus of the company production planning and scheduling activity.

Objectives and Deliverables: Summarizing the above discussion, McGuinness & Co. Brewing Company is currently in dire need for an analytical methodology and a set of computational tools, that will allow it to: (i) foresee its expected production requirements over a certain planning horizon, and (ii) organize appropriately its production activity, primarily the allocation of the three fermenters to the brewing of the different company products. Furthermore, given the continuous growth of the company annual sales, the company would also benefit by the disposal of an additional set of tools that would allow it to (iii) systematically manage / respond to its growth, through the purchasing and installation of additional equipment and/or the hiring of additional personnel.

Company sales data:

1. **Pale Ale:** This is the oldest brew offered by the company. Recently, the company teamed up with a major distributor in an effort to promote this beer at the Northeast coast (NY and Boston areas). The monthly sales data for the last four years are as follows:
   - 1996: (slight increase in demand, moderate variability)
   - 1997 – August 1999: (constant average demand, moderate variability)
   - Fall 1999 – January 2000: (increased average demand, higher variability)

2. **Stout:** The company has offered this beer only for the last 14 months. The monthly sales are as follows:
   - First 6 months: (sluggish sales with a very slight increase)
   - Remaining 8 months: (slight growing trend with rather high variability)

3. **Winter Ale:** This is a seasonal beer offered by the company primarily during the winter period. The monthly sales over the last four years are as follows:
   - (This beer should present a stable sales pattern, with its annual consumption located in the interval October – April – we must specify a reasonable set of seasonal indices)

4. **Summer Brew:** This beer is also seasonal, offered primarily during the summer season. However, McGuinness & Co. has offered this beer only the last two years, and the observed sales are as follows:
   - (This beer should present an increasing annual demand – it is a new product - and quite variable seasonalities – the company is still experimenting with the "right" offering span within the year)

[1] A capacity of 40 barrels is equivalent to 532 cases. Furthermore, a fermenter can be employed in ½ or ¼ capacity.

5. **Octoberfest:** This beer is an “image promoter” for McGuinness & Co., and it is offered only once a year, during the Octoberfest season. Specifically, the company delivers this beer to its distributors and the local restaurants only once a year, in late September or early October. The company sales of this beer over the last 4 years.

Your consulting organization is asked to provide forecasts for the next year's demand for the five beer varieties produced. McGuinness & Co. is interested in the expected average demand and in the forecasts corresponding to a 90, 95 and 98 % percent change of meeting the demand. You are asked to present your results to Mr. McGuinnes both orally and in a written report on Wednesday, September 27th, 2000 at the company location in room IC213.