Success story

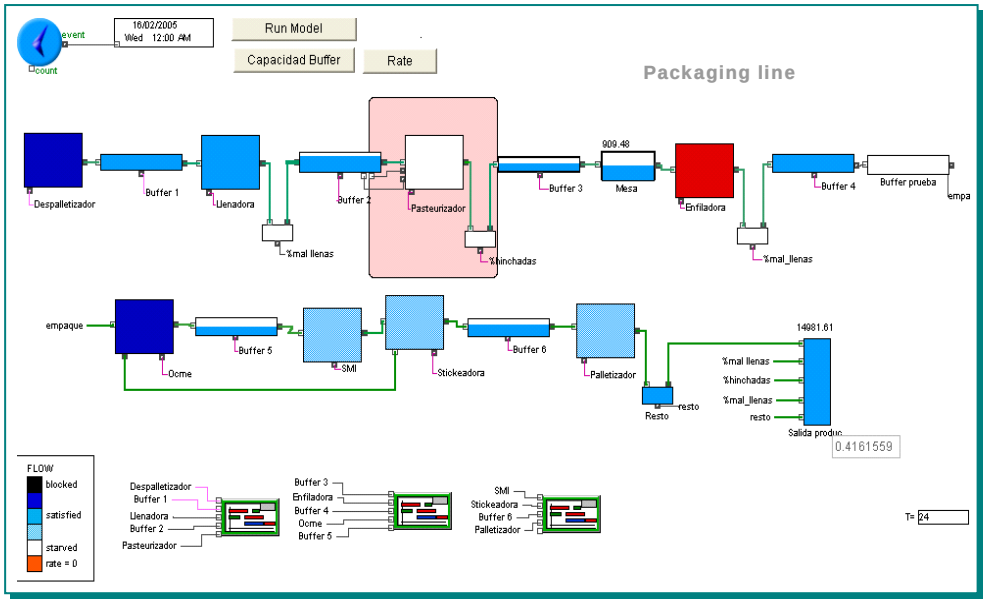
Flow architecture simulation: a powerful approach to buffer dimensioning in high-speed packaging lines

Performance simulation has been a powerful approach for process improvement since the successful introduction of Extend, Arena, and others performance simulation software packages by the end of '80s.

No matter that, the application of simulation to high-speed packaging lines remained a pending assignment until the launch of Extend's Flow architecture in 2001 by Imagine That!, focused on the accurate representation of high-speed packaging lines performance as a 'flow' of a continuous material fluid at different machine rates.

A modern packaging line, in the beverage industry as an example, is concentration of money, complex machines, conveyor belts, pipelines, and people under the same ceiling-roof working to bottle or can beer, soft drinks or other branded products.

Bottling lines are designed to work at a specific throughput rate, shift after shift, no matter the occurrence of machine failures or other production contingencies. The immunization of packaging lines against unexpected consequences coming from machine reliability is obtained by the right combination of machines and conveyor speeds and the occasional introduction of production buffers along the lines.



These production buffers are a core element of a line design, although they represent just a small part of the total investment; because if dimensioned correctly and placed appropriately they will ensure the right balance of the whole packaging line, allowing contingencies to be absorbed without hurting the final product throughput.

Submitting provisional designs in the early engineering stages of the packaging lines to performance simulation can save a lot of money and time; preventing flaws in the approach remain undetected in the myriad of details of a typical project.

But submitting actual performance of a high speed packaging line, after it is installed, could be equally decisive to ensure that the very last bottle or can this final design can deliver is actually obtained from the line.

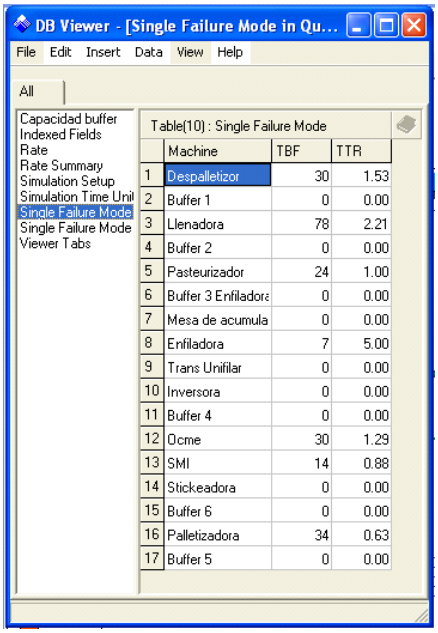
Applying performance simulation to buffer design is a key factor of success both in the engineering stage and in the improvement process stage in the life of a modern packaging line.

Zarate plant of Cervecería y Maltería Quilmes S.A. is located at 70 km of Buenos Aires city. Represents a huge portion of total brewery capacity, and moreover, the sole plant in the Quilmes' network of factories aimed to produce a broad scope of non returnable small bottles and cans of the slow-moving part of the product portfolio. Hundreds of SKUs are produced in small batches in two sophisticated state-of-the-art

packaging lines; besides other three more conventional ones focused on the high end, fast mover brands.

One of the complex lines was submitted to some design changes looking for a better fit with product line requirements and productivity improvement. But something went wrong in the process because actual figures in terms of throughput and productivity not only did not show such better results, but instead they decayed heavily.

Soon it became apparent that the size and set-up of a remodeled buffer could be the explanation of the unfair performance. A focused effort to record time between failures (TBF) and time to recovering (TTR) of the eight stations in the line, and the multiple conveyors connecting the stations among, were conducted. A complete data base was collected and filed appropriately. And for the first time a performance simulation model was put together to reproduce actual behavior of the line under the current conditions of machine and conveyor rates and product mix.



	Machine	TBF	TTR
1	Despalletizor	30	1.53
2	Buffer 1	0	0.00
3	Llenadora	78	2.21
4	Buffer 2	0	0.00
5	Pasteurizador	24	1.00
6	Buffer 3 Enfiladora	0	0.00
7	Mesa de acumula	0	0.00
8	Enfiladora	7	5.00
9	Trans Unifilar	0	0.00
10	Inversora	0	0.00
11	Buffer 4	0	0.00
12	Ocme	30	1.29
13	SMI	14	0.88
14	Stickeadora	0	0.00
15	Buffer 6	0	0.00
16	Palletizadora	34	0.63
17	Buffer 5	0	0.00

S&T was appointed to produce the simulation model and collaborate with an internal task-force of line supervisors, engineering staff, and production managers. The task was completed in few weeks and rapidly supported an accurate diagnostic about problems with the size and set-up of the remodeled buffer, in combination with machine and conveyor belt speed rates, size and allocation of the line crew –capital to ensure a right balance of throughput goals and TBF extension– and other set-up decisions.

The project was considered a pilot experience in the adoption of performance simulation approach to design, redesign and acquisition of bottling lines. And in the management of the huge bottling resources of the company: more than 36 lines in 12 factories, in 6 countries, with an aggregated investment value of $ 200 million, occupying more than a thousand people and producing 250 million cases a year of 300 different SKUs.

To know more about this successful application of flow-based performance simulation to process improvement in high-speed packaging lines call or mail Ricardo Alcides Rodriguez, and / or Rosana Marino, Extend's Flow Architecture Expert.

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