

What is Process Control? and Why You Should Care - Circular Economy

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BACKGROUND INFORMATION

We don't know, what we don't know.

In this article, I talk about a unique experience I had at a customer site.

Let me start by giving you some important background information required to understand my story.

The purpose of safety valves is to protect equipment integrity, and consequently people. When safety valves vent to the atmosphere, it's usually because the released product is not harmful to people.

High pressure steam, in the case of my story, was vented to the atmosphere to prevent over-pressurizing piping and vessels, as that will make them explode. With all the catastrophic consequences associated to that undesirable event.

The problem is that when the safety valves open, they are very loud. The higher the pressure, the louder the hissing.

When production plants are located away from urban centers, these events don't disturb the population at three in the morning.

CASE STUDY

This particular plant, was not located away from an urban center. The steam safety valves would open at any time there was a disruption in their, otherwise, continuous operation.

The residents of the area started calling the CEO of the company, following every event that woke them up, so that he too, could "feel the pain".

With the CEO being aware of this situation, he must have requested some answers from the plant personnel.

The issue raised by the control engineer was the stability of the steam distribution system, whenever the safety valve opened up.

The proposed solution from companies consulted about the situation, was the installation of a vessel to provide buffer capacity to the steam system.

Such pressure vessels require an ASME stamp. If you are not familiar with ASME's guidelines, they are strict and require highly specialized materials and specifications; in other words, a costly piece of hardware.

When I was approached to resolve the problem, I started by reviewing the strategies and the PID controller's tuning parameters.

After just a few hours of working to improve the dynamic performance of the system, the instrumentation technician that I was working with, turned to me and said: "Do you realize that you have made more progress in the last three hours, to address this problem than anybody else in the last 11 years?"

CASE STUDY CONTINUED

Later on, the plant manager asked if I could guarantee that the steam safety valve would not open again after what I had done.

As with all of my process control work, what I could guarantee was that the system would perform to the best possible capability, within the constraints of the system's field hardware.

A project was ordered to optimize the system. The optimization included better pressure sensors, improvement of control strategies, and optimum PID tuning.

In the end, the plant aborted the project intended to install the pressure vessel; as the resulting performance of the system was enough to lessen the "rude midnight wake up call to the population."

ECONOMIC BENEFITS

In terms of economic measures, the project saved the plant over 1.25 million dollars by not installing the steam buffer drum. With an ROI well above a 10X return, it was clearly a successful project that was resolved in less time, using fewer capital resources and human hours.

The outcome of this project was in fact, two wins!

1. The process was optimized so a minimum amount of steam would be vented to the atmosphere, and
2. Dematerialisation, as no new materials were required to solve the problem the plant was facing.

LET'S CIRCLE BACK TO THE CIRCULAR ECONOMY.

One of the critical facets of Circular Economy is dematerialization, which refers to the absolute or relative reduction in the quantity of materials used and/or the quantity of waste generated in the production of a unit of economic output (1).

In simple terms, getting more output with the same or less materials is critical to improving processes and optimizing the capacity of your hardware.

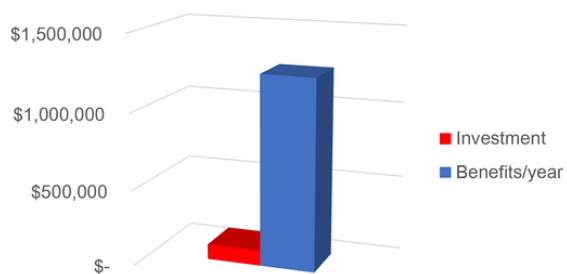


Figure 1 - Investment and Savings from Control Loops Optimization

HERE ARE A COUPLE OF TAKE AWAYS:

1. Process control can and will contribute to carbon footprint reduction, yield increase, and more. It is a must in any corporate sustainability strategy. I would argue that it is hard to disagree with increasing their yield +5% Year over Year without capital expenditures (CAPEX) projects.
2. When you are facing a problem in your unit operation that keeps you up at night, tell yourself: I should check for a process control solution to this problem.

REFERENCE

(1) Geissdoerfer, M., Pieroni, M. P. P., Pigosso, D. C. A., & Soufani, K. (2020). Circular business models: A review. *Journal of cleaner production*, 277, [123741]. <https://doi.org/10.1016/j.jclepro.2020.123741>