Success Story

Control Performance Monitor Ensures Effective APC Implementation for BOC Gases

Challenge

When BOC Gases, a global industrial gas company, decided to replace the poorly performing model predictive controller (MPC) application on their air separation unit at their Hartford, Illinois site, they sought out a method to deploy the new system quickly and inexpensively while maintaining safe and effective plant operation.

Solution

BOC partnered with Honeywell, a veteran of 49 APC implementations at other BOC sites, to apply a new MPC implementation methodology using powerful Tai-Ji technology in testing and modeling the Hartford plant.

Advantage

- Accelerated implementation of MPC application
- Reduced operator intervention
- Reduced downtime/loss-producing events
- Ability to change production rates quickly without upsetting the plant and key purities
- Improved load following on pipelines
- Improved constraint handling

Control Performance Monitor is Powered by Matrikon, which represents vendor neutrality. This product works with third-party control systems and applications.

Poorly Performing Control System Leads to Operator Control

BOC's Hartford air separation unit makes both liquid and gas products. On average, the plant produces 600 tonnes of gaseous oxygen and 650 tonnes of liquid nitrogen and oxygen. The site also has gaseous oxygen pipelines that feed nearby customers and a GAN pipeline.

BOC Gases monitors most of its plants from remote operation centers around the world, while the actual plant sites have only a few personnel working at any given time. Since they monitor most of the sites remotely, their operators are watching five to six plants at any given time. In order to ease the load for operators, BOC chose to implement a MPC for the Hartford plant.

In five years of operation, the performance of this original MPC consistently fell short of specifications. Operators complained of constant controller issues, which regularly led to the MPC being switched off and the plant running under operator control. With operators already burdened with monitoring numerous other sites, it was crucial that the MPC be revamped as soon as possible. The Hartford plant, according to the operators, was one of the most difficult plants to run outside MPC. Having a reliable MPC was a must.

It was critical that the new system be implemented quickly, in a much faster and safer time frame than conventional industry practice. The process at Hartford is nonlinear, especially the low pressure column purity control, which is extremely critical to operations. Running the plant outside MPC and under automatic (regulatory) control is difficult and can often require operator intervention to maintain product purities. Even with manual intervention, product purity, especially GAN or CLAR, can be lost. This causes major issues, since the operator is also responsible for operating five or six other sites at the same time. The time the plant spent in automatic and outside MPC control needed to be reduced to an absolute minimum.

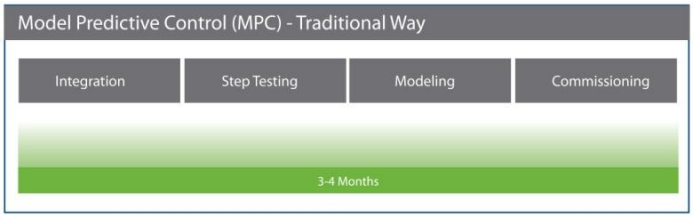
The end result of this methodology was the commissioning of a reliable, grassroots MPC controller in 12 work weeks rather than the industry standard of four to five months.

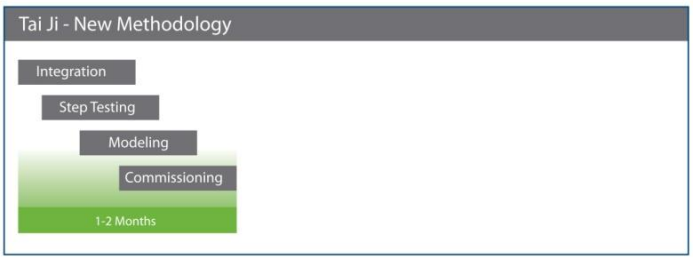
Reduced Control Performance Monitor Implementation Time by 50%

BOC decided to make use of Control Performance Monitor's Tai-Ji technology to greatly accelerate the commissioning process. Based on Dr. Yucai Zhu's industry-proven Tai-Ji ID technology, this method provided an alternative to traditional step testing and model identification methods. The advantages BOC saw in this method were threefold:

- It was automatic. Testing and model ID were done automatically rather than manually by engineering personnel.
- It was multivariable. Multiple MVs were tested simultaneously, making test time much shorter than single-variable tests.
- It was closed-loop. Tests could be performed closed-loop (MPC and/or PID), resulting in fewer disturbances and fewer operator interventions.

In short, this new method of MPC implementation allowed the modeling, step testing, integration and commissioning phases to overlap and occur simultaneously while requiring fewer personnel resources. This greatly reduced the risk of process upsets. The end result of this methodology was the commissioning of a reliable, grassroots MPC controller in 12 work weeks rather than the industry standard of four to five months.





The greatest challenge faced in this implementation was neither technical nor operational, according to Honeywell automation and optimization engineer Zul Bandali. Rather, it was achieving confidence in the results of the new method.

"BOC had a tough time in the beginning believing the results from Control Performance Monitor, but eventually their confidence grew and they accepted the results." Even then there was a challenge in getting operations staff, conditioned by five years working with an underperforming MPC, to trust the new controller. "The operators were used to seeing issues with the old MPC controller," says Bandali. "It took awhile, but the operators finally developed enough confidence in the new MPC."

Benefits: immediate and ongoing

The bottom-line benefits of implementing an MPC application in this compressed time frame is enormous. Engineering coverage, operator interventions, testing time and time spent analyzing data were each cut by approximately 50%. This is in addition to the well-known and industry proven benefits of having a reliable, well-modeled MPC.

At Hartford, the key areas of benefit were:

- increased LP column stability, leading to better CLAR recovery, reduced operator intervention and reduction of downtime or loss producing events
- the ability to change production rates very quickly without upsetting the plant and key purities
- optimization of evaporation tower
- better control of power demand, since the MPC can drive production while also maintaining the power demand targets set by the power company
- better load following on pipelines, as the MPC controller can quickly adjust plant production to meet changes in pipeline demand
- better constraint handling
- improved ramping, with an overall average ramp rate improvement of 220% to 650%

"The LMPC system has been in place five months now, and our downtime on argon has been reduced by over 75%. The plant will run for weeks or longer without operator intervention being necessary on the LP column purity."

"LMPC has done a much better job than our previous APC system in maintaining the ever-so-critical low pressure column purity control," says Mike Golinsky, a remote operation center engineer at BOC. "The LMPC system has been in place five months now, and our downtime on argon has been reduced by over 75%. The plant will run for weeks or longer without operator intervention being necessary on the LP column purity."

Golinsky estimates that they save about $20,000 per year from reduction in upsets alone. Industry experience shows that a solid MPC implementation will provide $80,000 to $85,000 of annual savings to a plant.

After its demonstrated success at Hartford, this methodology will be carried forward on subsequent MPC implementations at the remaining eight plants in a nine-site rollout with BOC.

"Using Control Performance Monitor to step test the plant in a closed loop mode was great," says Golinsky. "It reduced testing time, improved model quality, and, most importantly, reduced the risk of a loss-producing event occurring during the testing process."

For more information:
For more information about Control Performance Monitor, visit our website www.honeywell.com/ps or contact your Honeywell account manager.
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