Cutting Energy costs in Spray dryer operations

Huge energy cost continues to affect profitability in spray dryer operations. Eliminating non-productive energy use can reduce annual costs drastically…

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Reducing or eliminating non-productive energy use in spray dryer operations can reduce annual costs by $200K - $300K. This can significantly improve profitability on a very tight-margin product. As high energy cost continues to affect the profitability of making powder, reducing and maintaining these costs become more important. The economic optimisation of dryer operations requires improvements in both the routine continuous operation and changeovers. In both operational modes, the real-time visibility of processing provides the key to optimisation.

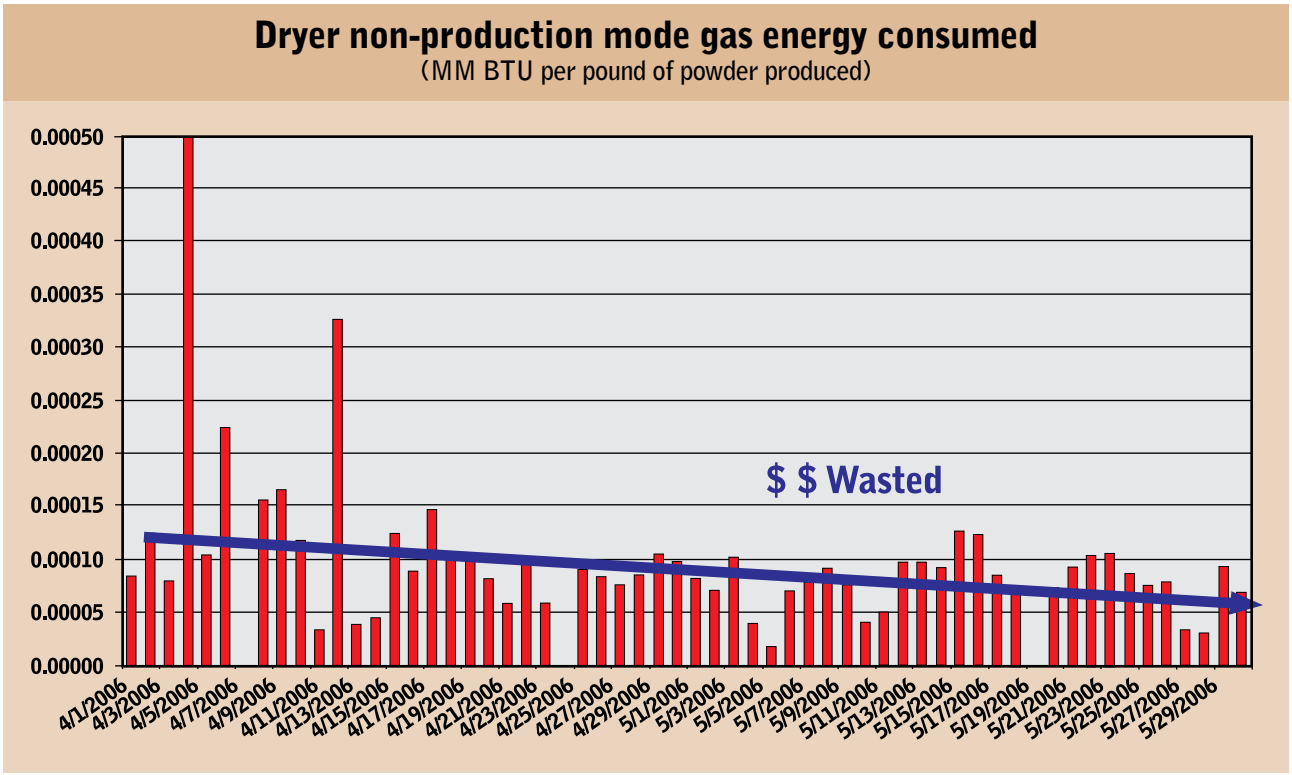
The optimisation processes during changeovers are complex and nearly impossible to get perfect, however the largest improvements are found while correcting avoidable human mistakes. These errors are best discovered with real-time visibility of operations.

Energy use during normal production

The energy use per pound of product varies by about 15 per cent from day to day in this plant, in a non-random pattern. Vigilistics, based in Southern California, includes 'drill-down' capability to help identify the underlying reasons for the variations. Attainable improvements in energy use are indicated, if the better daily operation can be consistently achieved. (*See figures*)

In the given example, the energy use in non-production modes was analysed automatically by the Vigilistics technology system. The large peaks are due to operator behaviour. The visibility of energy waste resulted in providing the operator with better guidelines; the energy use during non-production modes was minimised. The savings achieved amounted to about 3 per cent of plant energy use. Continued real-time visibility allows the energy use during changeovers to be monitored and maintained.

In continuous operation, a dryer is easy to control, but optimisation is more challenging. The easiest and most obvious control is to somewhat over-dry the powder, short of compromising quality. This simplistic solution makes the operator's job easy, but it has higher than necessary energy use and associated costs. The last few tenths of a per cent in drying are the



most costly, and energy savings from optimisation of moisture can easily be hundreds of thousands of dollars per year.

The operator is trying to maintain a target moisture. This target is set conservatively at a lower value than the economic optimum, to avoid the problems of sticky powder on the high side. The variability of moisture leads to the conservative target.

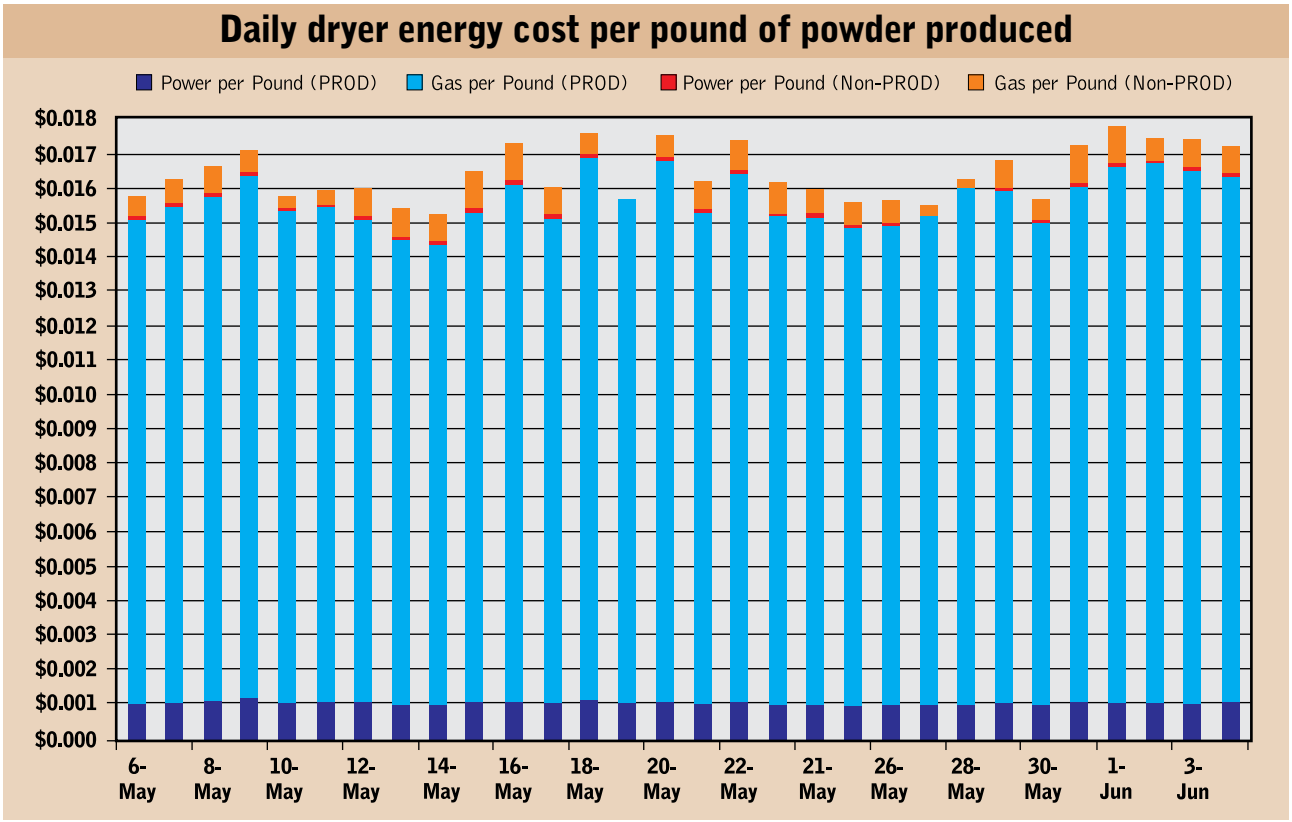
To change this situation and operate closer to the optimum, there are several approaches. One solution is to measure moisture more frequently causing a frequent control action, whether manual or automatic; the limitations are in the reliability of the measurement and the speed of the disturbance. If the cause of the disturbance is short lived, then a strong control action can make the situation worse. This feedback approach is useful for small adjustments to avoid long-term off-target operations.

A second approach, which is best used together with feedback, is to detect the disturbances earlier and apply corrective action before the moisture is affected. This feed-forward control or model-based control methodology improves the situation if the disturbances are measurable and the control action or model is well-tuned. If the cause of the disturbance is unmeasured, this approach does not help. Also care has to be taken that the control action or model does not take erroneous action that makes the problem worse.

A third and best approach is to try to eliminate the disturbances, which most often result from changes in the evaporators. An upset to the steam due to change-overs elsewhere in a plant can cause disturbances to the evaporators; and these disturbances feed directly into the dryers. Improvements in monitoring and controlling steam reduce disturbances to evaporators and dryers.

The best dryer optimisation will include all three of these approaches; it all starts with accurate real-time visibility of operations. Operating spray dryers at current natural gas and electrical prices may be a losing proposition. A typical powdered milk spray dryer can consume two to three million dollars a year in natural gas alone. For the past year, Vigilistics, based in Southern California, has been analysing production spray dryer operations and compiling data on natural gas and electrical burns for each mode of dryer operation, summarised in 24-hour periods. This information and analysis have been carefully related to spray drying operations throughout the United States.

The goals of the analysis are to use real-time information, continuously monitor and analyse the energy



usage of a spray dryer compared to mode of operation and products made. The study has revealed that energy burns during non-productive tasks (such as CIP, burner lighting, fan starts, and running on water while the dryer is waiting for other areas of the plant to deliver product) may provide real and relatively simple opportunity for savings. The data revealed that proud operators in many manufacturing environments always have their equipment up and running and ready for the rest of the plant. Providing daily feedback to the operators on the energy cost of producing their powder can reduce energy burn by up to 15 per cent. Monitoring every operational mode to identify the amount of energy burned during each activity provided a powerful tool in reducing unnecessary energy costs. When conscientious operators can see the impact of their 'readiness', they change, and start the dryer 'just in time'. i2.0

Thomas R Cutler is the founder of the Manufacturing Media Consortium of twenty seven hundred journalists and editors writing about trends in manufacturing. Cutler is also the author of the Manufacturers' Public Relations and Media Guide. Cutler is a frequently published author within the manufacturing sector with more than 300 feature articles authored annually; he can be contacted at trcutler@trcutlerinc.com.