Energy savings

Quality is an energy-saving issue

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ACHIEVING OPTIMUM PRODUCT QUALITY IS OBVIOUSLY HIGH ON THE LIST OF ANY MANUFACTURER, FOR ALL KINDS OF REASONS – MANY OF THEM FAIRLY OBVIOUS AND MOST OF THEM RELATED TO COST. HOWEVER, THERE IS A QUALITY-RELATED COST WHICH IS RELEVANT AND IMPORTANT TO REDUCE, BUT WHICH IS OFTEN OVERLOOKED: THE COST OF WASTED ENERGY AS A RESULT OF POOR QUALITY PRODUCTION. SO NOT ONLY IS QUALITY AN ENERGY-SAVING ISSUE, BUT ENERGY-SAVING IS A QUALITY ISSUE.

Poor quality production which makes it out of the factory means dissatisfied customers. But even poor quality production which is spotted before it gets that far means wasted time and raw materials. Take that to its logical conclusion and ultimately it means wasted energy too: at every stage from the production process which didn't produce anything saleable, to the energy cost of recycling the sub-standard finished product for reuse of the raw materials. (In the case of, for example, an aluminium casting, that cost is enormous.)

At its simplest, if you are making something twice instead of once, it is a clear waste of energy which, if quality is satisfactory, need never happen. Improving quality may seem essentially an internal issue. However, closer analysis will show that the inextricable integration of a production process means that consideration of a machine, its components and its controls can help to achieve improved quality just as much as more obvious approaches.

ERIKS, for example, is highly experienced in conducting air leak surveys. By identifying the location of an air leak and correcting it, you ensure the right pressure is available in pneumatic systems, which then means the right force is being applied, which in turn leads to the right quality of finish for the final article.

Of course no-one knows or can understand your production process as well as you do. Your machine builder may be able to help you with certain aspects of optimising your OEE (see box), but an alternative approach provided by a partner such as ERIKS – with their passion for technology covering every component of your production plant – can isolate individual problems affecting availability, performance and quality, and help you to overcome them, sometimes with a decidedly lateral approach.

In the case of Kodak's photographic paper manufacturing plant at Harrow, ERIKS not only addressed and resolved a major problem causing up to £6,000 of downtime every two months, but also a much smaller related problem, demonstrating real know-how and attention to detail.

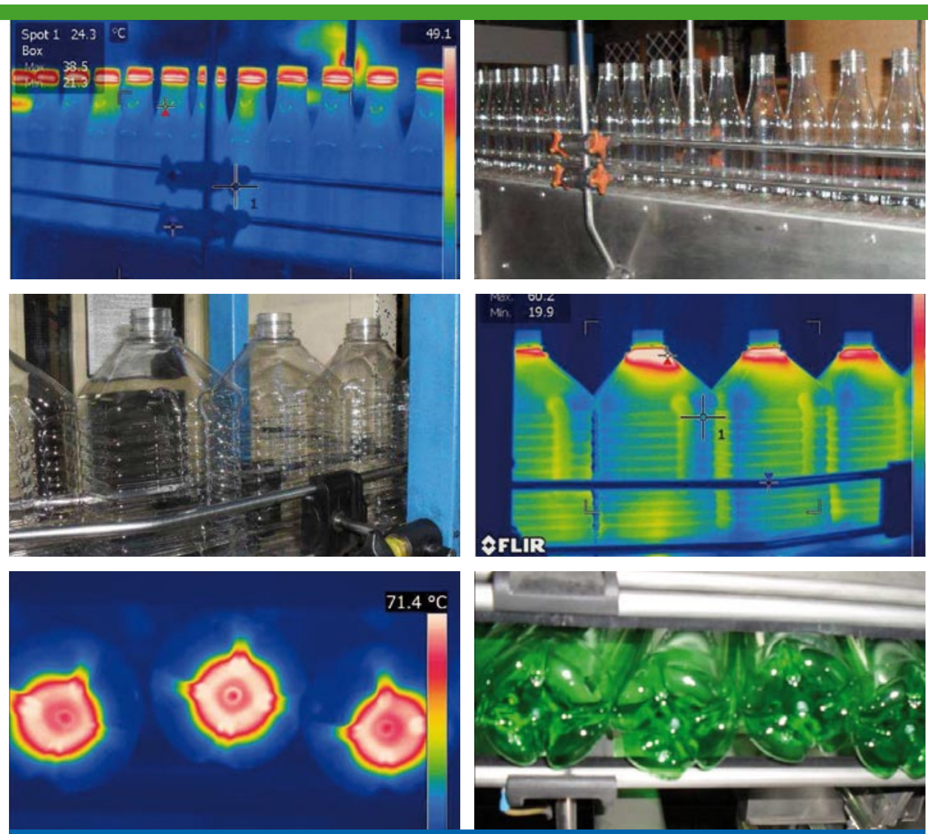
The high ambient temperatures within Kodak's plant were causing lubrication in bearings to break down, leading to seizure of rollers. The standard high temperature incremental encoders used for positional feedback information from the rollers were being replaced every two months in a 1½ hour operation, at a downtime cost of £70/minute. If the seizure occurred during a production run the quality of the whole batch was also compromised by exposure to light during a repair. ERIKS replaced the standard encoders with bespoke models, rated for operation in 120°C ambient temperature, with high temperature sealed grease lubricated bearings, and aluminium component mounting discs to dissipate heat. The fact that these encoders are still in operation after twelve months demonstrates the effectiveness of the solution.

However, ERIKS attention to detail is shown by the fact that the mounting design was also changed, from an awkward collet arrangement to a slot and grub screw fixing, which is far easier to use in the limited lighting conditions of the plant.

In the belief that prevention is better than cure, ERIKS can also help further up the production chain, through involvement with the machine builders themselves. Working closely with OEMs, ERIKS can help with the design for manufacture of components, to ensure they are as efficient and effective as possible: which will in turn lead to greater availability, higher performance and fewer quality issues with the finished product. Whilst this article has been considering quality, availability and performance are the other two factors which combine to deliver Overall Equipment Effectiveness, or OEE.

As the box opposite explains in more detail, OEE is a way of taking even the most complex production process, breaking it down into the three strands of availability, performance and quality, and then converting them into a metric that immediately shows you the status of your manufacturing process. And once you know that, you're well on the way to being able to do something to improve it, and to measure how effective the improvements have been in terms of 5S, Lean Manufacturing, Kaizen, Six Sigma and other process or business management practices.

Knowing the OEE is one thing. Improving it is another thing entirely. But with the understanding that quality can have an often overlooked effect on energy use and energy saving, it is obviously one area worth close attention. However, achieving the right result can require a fresh pair of eyes, a different, external perspective, and real know-how.



Calculating Overall Equipment Effectiveness

The calculation for finding the OEE of your production process isn't a complicated one. It's simply:

Availability x Performance x Quality = OEE

Availability means the time your plant is in operation. Breakdowns obviously reduce availability, but so does planned preventive maintenance, lack of operators and any other causes of downtime. Performance is the efficiency of the machine and its operator. This can be reduced by wear and tear, misfeeds, a less skilled operator and so on, all of which can mean the machine doesn't run at its full rated value for the whole of its operating period. Finally, quality is the amount of the production that is scrapped or reworked because it is not up to the required standard.

Obviously a figure of 100% is the ideal OEE, but this is impossible to achieve in the real world, so most businesses aim for 85% as a realistic target.

An example of an OEE calculation is as follows:

1. Determine the equipment's overall availability rate, by dividing the operating time by the planned production time. For example, if the equipment operates for 400 minutes but the planned production time is 500 minutes, the availability rate is 400/500, or 80%.
2. Determine the equipment's overall performance rate, by dividing the ideal cycle time by the actual cycle time. Cycle time is the amount of time it takes to produce one piece. So, if the ideal cycle time is 100 pieces per minute and actual cycle time is 75 pieces per minute, the performance rate is 75/100, or 75%. (To determine the actual cycle time, divide the number of pieces produced by the amount of time taken to produce them.)
3. Determine the equipment's overall quality rate by dividing the number of good pieces produced by the total number produced. For example, if the equipment produced 400 pieces but 20 were defective, that would mean only 380 good pieces. So dividing 380 by 400 results in an equipment quality rate of 95%.
4. Multiply availability rate x performance rate x quality rate. The product of the three numbers is the Overall Equipment Effectiveness, or OEE. Using the example above: **0.8 (step 1 result) x 0.75 (step 2 result) = 0.6. Multiply this by 0.95 (step 3 result) = 0.57 or 57% which is the OEE.**