Tips for IncreasingPlant Productivity

Start by examining batch time and process controls

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By Bernard Seguy

Question:

We have an old alkyd and polyester resin manufacturing plant. We want to increase productivity. Can you suggest some ways to do this cost-effectively?

Answer:

Productivity, measured as the annual production of a given plant, is a key factor in assessing manufacturing costs. It is not surprising that many alkyd and polyester resin manufacturers &#151 under competitive pressures &#151 want to improve the productivity of their existing equipment at minimum cost. Let's review several cost-effective ways they can increase productivity.
The first area to look at is batch time. In modern plants, typical batch times are 16-19 hours for alkyds, 14-16 hours for saturated polyesters with phthalic anhydride feed and 18-25 hours for saturated polyesters with isophthalic acid feed. Of course, batch times vary somewhat from plant to plant due to different recipes and types of operations. Generally speaking, batch times are 20 percent to 50 percent longer in old plants. This leaves a lot of room for management to spend a few dollars and justify a return on investment. Shorter batch times mean higher production rates with the same equipment. Consequently, one must look for the obvious bottlenecks in the process including the three outlined below. &#149 The raw material loading and/or product unloading steps may take too long. This can be fixed easily by retrofitting larger equipment with proper automation. &#149 The heating and cooling transfer rates may be too slow. This is a more difficult task to tackle because they are limited by the design of the reactor and the agitator. Assuming that replacing the reactor is not a solution due to its prohibitive cost, two alternatives can be considered. One is retrofitting a new agitator, which can provide gentle but more efficient horizontal and vertical mixing. The second is modifying the existing heating/cooling system to provide better control of the heating/cooling rates, thus minimizing potential fouling or degradation of the product and accelerating the energy transfer. &#149 The distillation and decantation systems

may be designed improperly or undersized. Revamping the existing equipment, adding more controls or operating the distillation column under vacuum may be the answer. The next area to look at is process controls. It is important to examine the state of the existing instrumentation. Modern resin manufacturing plants use PLC-based control systems with human-machine interfaces at a minimum. More sophisticated systems have recipe management software. When touring an old plant, one of the most striking points is the lack of reliable instrumentation. Adding computers and basic instruments, such as mass flow meters, load cells and temperature transmitters, is a relatively inexpensive solution to the problem. Monitoring product viscosity and acid/hydroxy numbers is paramount to quality control in alkyd and polyester resin manufacturing processes. Most plants use the old-fashioned method, which consists of grabbing a sample from the reactor and testing it in the lab. During this procedure, valuable time &#151 typically 30 minutes &#151 is lost. The chemical reaction continues, and the reaction end point remains a guess. The net result is an approximate chemical composition of the final product. To overcome this problem, some plants have installed reactor-mounted viscometers but without much success. A state-of-the-art solution is to retrofit continuous in-line viscosity and acid/hydroxy number measurement systems. Such systems are reliable and give instantaneous measurements of key parameters. The operator knows the state of the reaction and the product characteristics at any time during the batch process. In addition, the signals sent by the instruments can be integrated into the existing process control system. The benefits include consistent on-spec products, shorter batch times, less labor involvement and safer procedures. Since each plant is different, a complete technical audit of existing equipment and a thorough review of operating procedures by experts will determine which of these cost-effective solutions is the best to improve productivity.

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