

## Solutions as Good as Gold: Metalor Technologies



An international leader in the powdered metals industry, Metalor trusts Minitab for help in developing innovative and reliable quality improvement solutions.

Swiss-based Metalor Technologies, an international leader in precious metals and advanced materials, is a supplier to companies around the world that produce electronics and to manufacturers of medical and electrical equipment. Metalor's skill in creating innovative and reliable technology has earned the company a preferred-vendor status and a global reputation for excellence. In fact, well beyond the benefits to its own interests, Metalor's expertise has fostered the creation of new market segments for many of its partners. In its quest for innovative solutions, Metalor relies on Minitab Statistical Software for help in achieving its process engineering goals.

### KEY FACTS

#### ORGANIZATION

Metalor Technologies SA

#### OVERVIEW

- Founded in 1852
- Headquartered in Switzerland with subsidiaries in 15 countries
- Divisions include refining, advanced coatings, and electrotechnics
- More than 1,600 employees worldwide
- Annual revenues over \$330 million

#### QUALITY CHALLENGE

Analyze the effects of key process factors to improve the manufacturing process and product quality

#### PRODUCTS USED

Minitab® Statistical Software

#### RESULTS

- Reduced process variation by 50%
- Reduced rejected lots by 75%
- Produced higher quality powder

### The Challenge

Among Metalor's products is a high-purity silver powder that is used in the fabrication of a variety of micro-electronic products that range from solar cell metallization on silicon wafers to membrane touch switches on flexible plastic. Two properties of the powder—density and surface area—are critical to its quality and performance in their customer's processes. However, these two properties are very difficult to predict or control in production. Using the Design of Experiment (DOE) tools in Minitab, as well as some DOE best practices of its own, Metalor set out to determine how density and surface area were affected by three key process inputs: reaction temperature, ammonium level, and stir rate. Their ultimate goal: to improve the quality of their silver powder.

### How Minitab Helped

Once Metalor identified the three key factors in its process, it analyzed them to determine their effect on its silver powder products. A full factorial experiment in Minitab—using only one high and one low setting for each input—let Metalor efficiently evaluate the effect of each input, as well as the interaction effects between

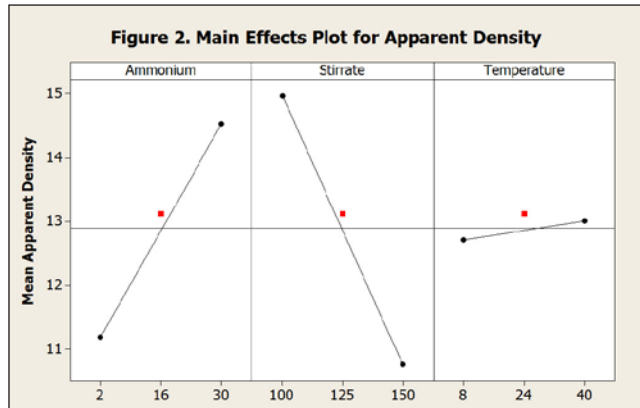
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these inputs, on the two output variables of interest. Minitab's power and sample size calculations indicated they needed to replicate the full factorial in order to achieve the statistical power needed to detect the effects that were important to their process. Their Minitab analysis resulted in two equations that were used to generate an overlaid contour plot showing both responses as a function of the process conditions. The plot helped Metalor adjust their process to meet customer specifications for both the density and the surface area of their powder. Once the new process settings were implemented, Minitab's control charts clearly showed the sustained benefits of the improved process.

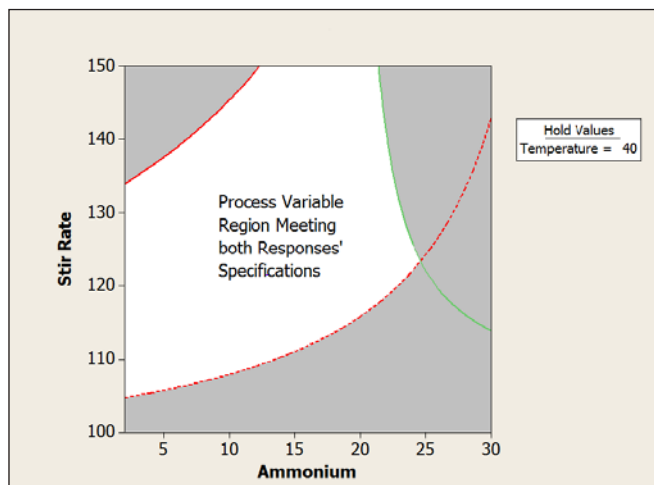
## Results

Silver is expensive so reduced experimentation was necessary to control costs. Nonetheless, Minitab helped Metalor find the solution that decreased variation in their process by 50% and improved the quality of their silver powder. The solution was implemented and the process monitored over time. Minitab control charts illustrated the significant decrease in process variation that led to a higher quality powder that met customer specifications. In addition, these improvements reduced rejected batches by 75% and made Metalor's silver powder production more efficient and cost-effective.

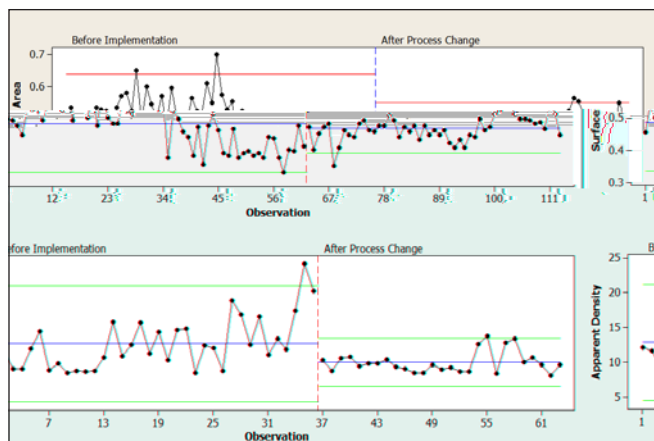
Metalor's process engineering innovations make the company a leader in the industry—a leader that trusts Minitab to be an effective partner in its quality improvement efforts.



This main effects plot for density clearly shows that two of the three factors Metalor tested had a stronger effect on the powder's density.



Minitab's DOE modeling functionality provided an overlaid contour plot that was used to find the optimum process conditions needed to meet the specifications of both responses.



Minitab control charts demonstrate the dramatic effect of implementing the optimal process conditions determined by the experiment. ▶



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