

## Boosting the Performance — LED Semiconductor Die-Bonding Machine

Elmo increases machine throughput and accuracy to speed manufacturing

### The Background

The company manufactures advanced machines for bonding solid-state light-emitting diodes (LEDs) that are used in a wide variety of applications like LCD TVs, LCD monitors, note PCs, and mobiles, LED lighting products and automotive lighting applications. Providing improved lighting while consuming less power and reducing emissions of greenhouse gases, electroluminescent LEDs are growing in popularity as they replace incandescent and fluorescent light sources.

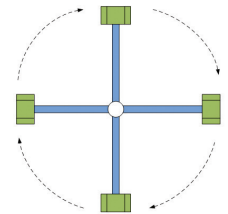
### The Challenge

As an innovator and high-volume producer, the company was interested in faster and more cost-effective ways to produce industry-leading LEDs and wanted to improve the speed and accuracy of its automated die-bonding machines. In the machines, two DDR motors rotate 90 degrees and must settle into position very quickly and accurately. There are 20 axes in all, while two of them are especially critical and demanding. The motion profile includes a high-resolution encoder with 512 Sin/Cos cycles and 2048 internal interpolation results in 1,048,576 counts per revolution.

#### Elmo was challenged to produce a motion control solution that would achieve:

- ▶ 90-degree PTP motion in 40 msec
- ▶ Settling time to  $\pm 25$  counts in 5 msec

DDR motor shaft  
connection to the  
rotational load



### The Solution

Elmo applied its solution of a direct-drive rotary motor (DDR) shaft connected to a rotational load controlled by Gold servo drives and powered by a dedicated Elmo power supply. Elmo's Gold Line of servo drives features distributed intelligence, synergy and a wide variety of features designed to handle complex industrial automation applications. The built-in operational simplicity, from each individual component to the entire system, combined with an innovative single software environment that interfaces with all units and servo motors, ensures the highest level of performance.

The compact, direct-to-mains power supply, TAM-20/230, is designed for multiple servo drives. It rectifies AC input voltage of up to 1 x 230 VAC into filtered DC voltage with a continuous output current of 20 Ampere (40 Ampere peak current for up to 3 seconds).

The Elmo solution used a 3-stage gain scheduling and acceleration feed forward servo loop functionality. It included software high-order filters for velocity and position control loops. Employing high-velocity/position loops bandwidths, the solution was able to achieve all of the customer's requirements and much more.

#### The Elmo solution included:

- ▶ 3-stage gain scheduling and acceleration feed-forward servo-loop functionality
- ▶ Software high-order filters for velocity and position control loops
- ▶ High-velocity position loop bandwidths



**Gold Drum Servo Drive**  
11-390 VDC  
Up to 11.2 Kw

# Success Story

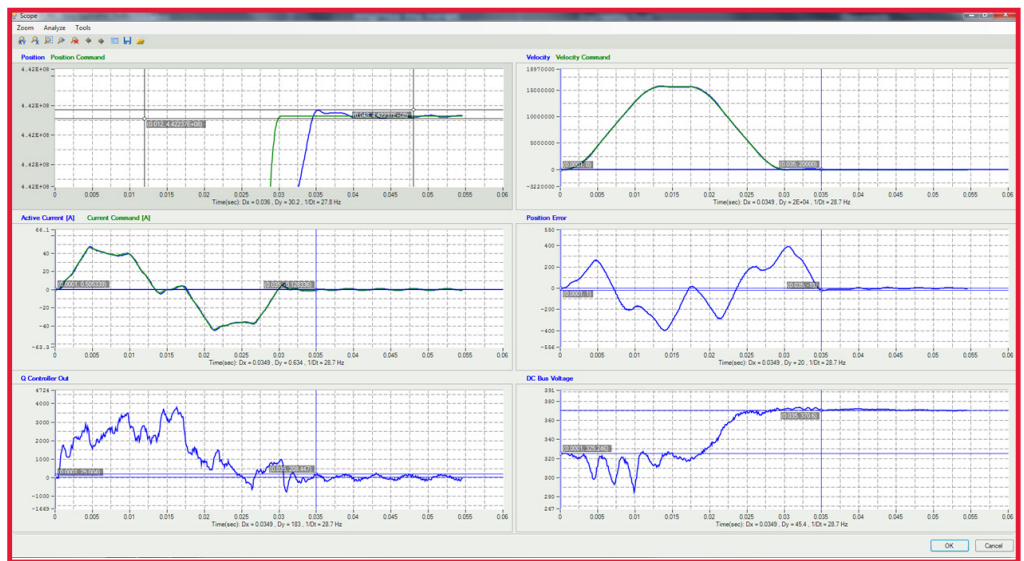
## The Benefits

Elmo outperformed all other solutions and was the only one that could achieve the motion profile in less than the required 40 msecs. In fact, Elmo's solution went far beyond the requirement, further reducing the motion profile to a mere 35 msecs.

Elmo also achieved the highest accuracy. With Elmo's solution, the die-bonding machine was able to settle into a very low  $\pm 15$  count position error in only 5 msecs.

Using Elmo Application Studio (EAS), several hours only were needed to successfully implement the solution. Running on a PC, EAS provides a user-friendly environment that takes care of all engineering requirements. It can program, tune, configure, optimize, set-up, and network any single or multi-axis servo application. EAS makes all Elmo products easy to use and access, containing the tools for developing all phases of a project. It cuts integration time and maintenance costs.

**Motion Profile results, settling into  $\pm 15$  Cnt position error after 35 msecs (30 msecs motion + 5 msecs settling time)**



### Elmo's solution provided:

- Accelerated machine throughput resulting in more output in less time
- High power in a compact size to fit the limited machine space
- Fast and precise machine operation
- Advanced software functions for enhanced servo performance
- Power consumption of only 12 amps in the power supply and 18.45 amps in the motor, both well within requirements
- Fast and easy implementation process

## The Summary

Elmo's solution for this die-bonding machine is the state-of-the-art in accurate and speedy motion control, saving the customer time and money in implementation and execution. With industry-leading Mean Time Between Failure (MTBF), Elmo products continue to perform reliably at the highest levels in the field.

## Inspiring Motion..

Elmo designs, manufactures and sells innovative Motion Control solutions for military and industrial automated systems.

Our technology turns axes faster, with better precision and greater synchronization.

Our products achieve better results, cost effectiveness and maximum throughput in any given mechanics.

**We are Inspiring Motion..**