Crash Talk: High Impact Quenching

Introduction

Granco Clark, Inc., (GC) of Belding, MI, has been designing and manufacturing high performance aluminum extrusion equipment for decades. They focus on all the critical steps that transform raw billet into precision aluminum extrusion. Extrusion quenching at the press exit is one of the most critical steps for certain alloys and is one area of expertise for GC.

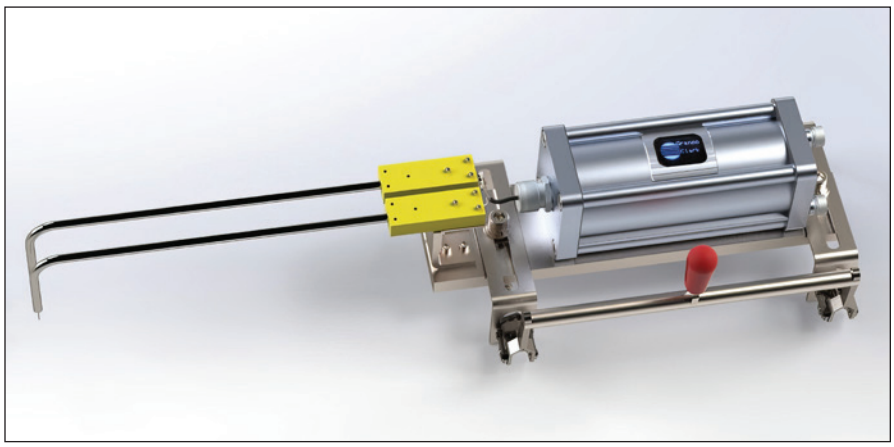

Figure 1. The Granco Clark Data Locust device connects directly to an extrusion and travels through the quench.

High Impact Quenching

As extrusion quenching experts, GC does a lot of crash talk that's backed by data. This crash talk refers to automotive crash components that are extruded from aluminum alloy. As the automotive industry becomes increasingly aluminum extrusion intensive, extruders need high performance quench systems that can meet the high bar of crash standards for automakers. With such stringent requirements, one may think a longer quench system is better, but that is not the case. The metallurgical pass/fail window for crash components is exceptionally narrow, so proper quenching needs to happen quickly. GC's high impact velocity quench can reliably break through the steam barrier (Leidenfrost effect) and meet crash profile cooling standards in less than one meter.

To demonstrate the effectiveness of their high impact quench to end users, GC developed a Data Locust thermocouple (patent pending), shown in Figure 1. This device easily clamps directly to the profile before entering the quench and remains attached while it travels through the quenching system. It can be removed at the exit of the quench. This allows the user to collect precise, real-time quenching data.

Certainly, not all extruders are producing automotive related products, however, quenching is still a critical aspect for many. While the high impact quench can quickly break through the steam barrier, it is also designed with the capability to first stabilize the shape and control the contour, followed by more rapid cooling to lock in metallurgical properties (Figure 2). GC calls this progressive quenching. Often, there is still ample quench length remaining to continue cooling the shape for safe handling.

Through finite element analysis, GC determines the appropriate quench length for a specific application by studying the cooling characteristics of the extruder's exact shapes to be targeted as well as the space available in the lead-out area.

Although there are many factors when determining a proper quench system, the available space for a new quench should also be a rather obvious consideration. The lead-out area of a press line (press platen to first belt of the table) is valuable real estate for optimizing extrusion speeds. A quench of unnecessary length could have an adverse effect on productivity when installed on an existing press line.

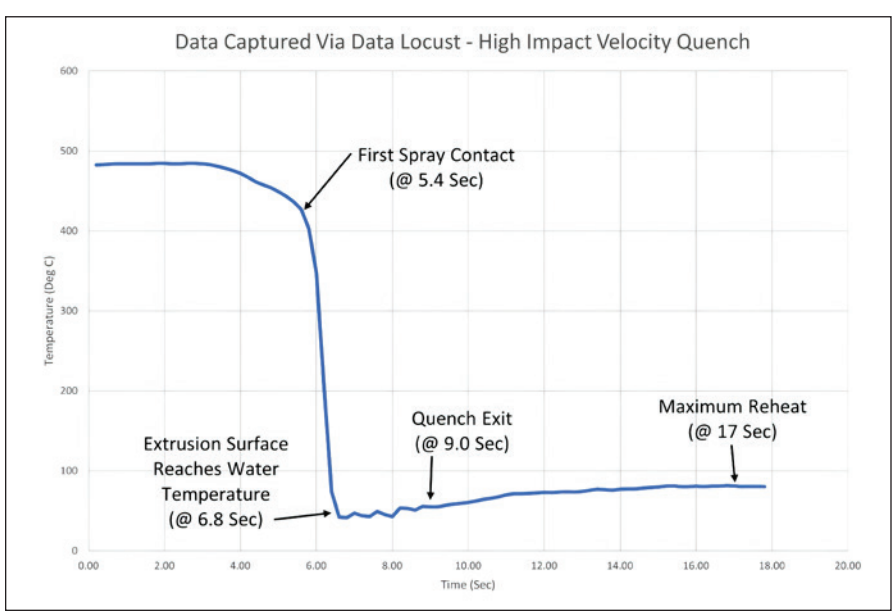

Figure 2. This graph shows test data taken while using Granco Clark's Data Locust thermocouple, showing the features of a high impact quench.

Conclusion

Looking beyond what the extruder's quench needs are today, the full capabilities of the press should also be considered, so that potential future business is not limited by an inferior quenching system. GC offers a high-performance quenching system for extruders in order to help automakers meet crash component standards. The company's new Data Locust thermocouple is able to support the system by providing real-time quenching data. With these products, the company is able to tailor the quenching system to meet an extruder's specific needs. ■