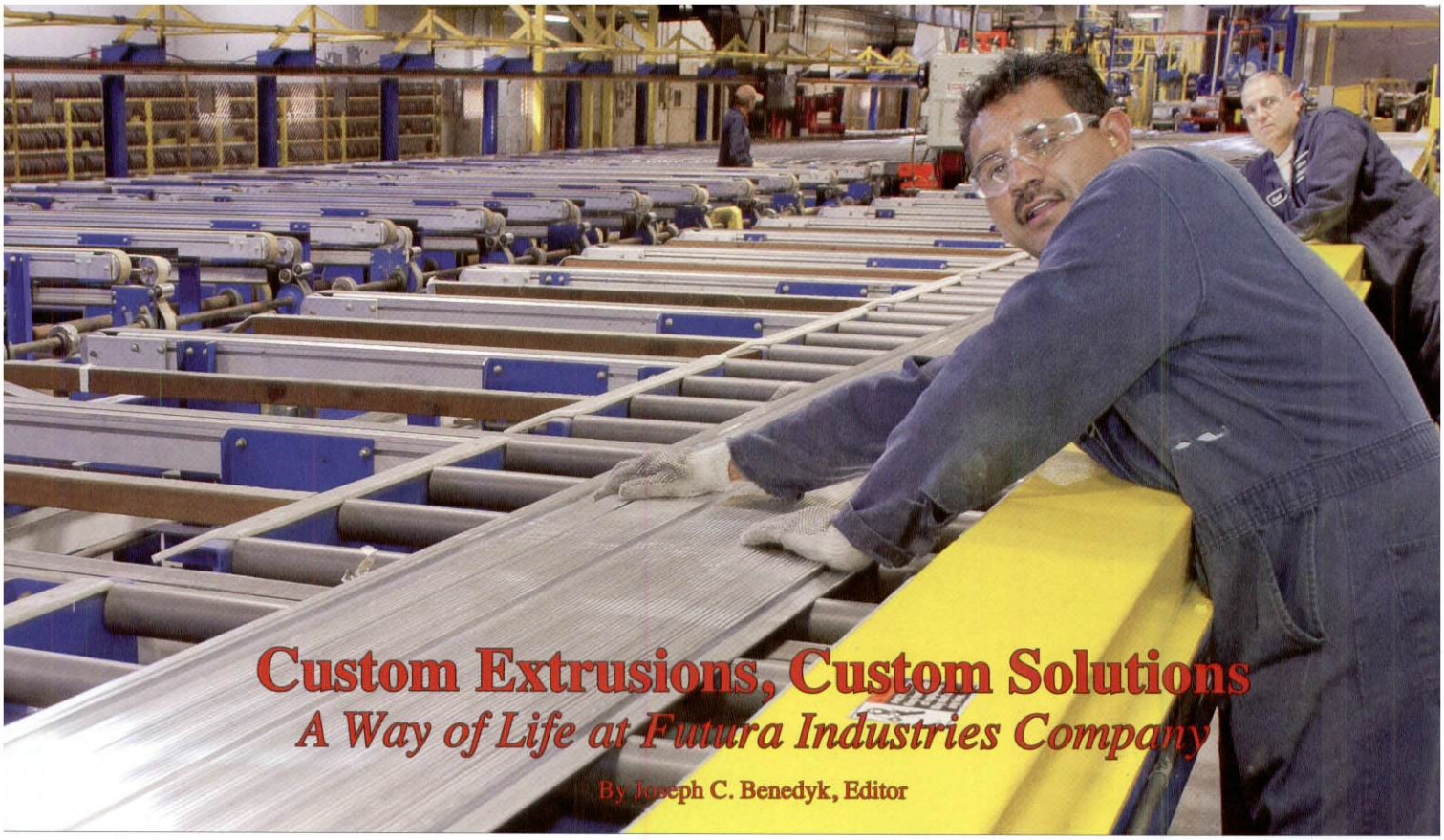

Custom Extrusions, Custom Solutions

A Way of Life at Futura Industries Company

By Joseph C. Benedyk, Editor

Figure 1. After the auto-stretch cycle, thin-walled floor trim extrusions are examined by Eduardo Rivera (front) and Jorge Lerma as they are cut and staged for ongoing cycle.

Located in Clearfield, UT, just outside Salt Lake City, custom extruder Futura Industries Company has developed a reputation as a manufacturer of not only custom extrusions, produced on their two 7″ presses, but also a provider of custom solutions to its customers. Although providing solutions to customers is almost universal in the extrusion business today, Futura has built a highly successful bottom line by formalizing this approach throughout their organization. Susan Johnson, president and ceo of Futura Industries, notes that even though aluminum extruders have been hit hard in recent years, Futura has remained prosperous. How has Futura prospered through this past recession, and how does it continue to prosper and gain market share within its carefully selected customer base?

A few answers are apparent from observations made during our visit to the Futura headquarters and plant in Clearfield. Upon entering the foyer, visitors are greeted warmly, and one cannot help but admire that one wall is lined with awards, bestowing recognition of excellence to Futura in several categories. The awards include the 1999-2009 Work/Life Award – Medium Company Category (One of Utah's Best Companies to Work For & Top Ten Family Friendly Employers) from the Utah Department of Workforce Services; the Corporate Safety Award of Merit in 2009 from Utah Safety Council; the "SHARP" Safety and Health Achievement Recognition Program Award for 2006, renewed in 2009, from the Utah OSHA office; the Orion Environmental Stewardship Award in 2009 and 2006 Manufacturer of the Year Overall from the Utah Manufacturing Extension Partnership; the 2005 Manufacturer of the Year for Continuous Improvement from the Utah Manufacturing Extension Partnership; and ISO 9001:2008 Certification.

Imposing as these awards are, they beg the question as to what this medium-size extruder and manufacturing company does differently to make it stand out so well. Sorting through the reading material displayed in a company foyer usually gives an indication of the company culture, and we were not disappointed in seeing the latest copy of *Light Metal Age*, but also, surprisingly, the latest copies of *Harvard Business Review*, *Business Week*, and *Forbes* magazines. Are we visiting an extrusion plant or what?

Soon enough, the question was answered. Spending the day touring Futura's 132,000 square feet of plant and 110,000 square feet of warehouse and talking with Futura's management—Susan Johnson, Ken Wells (v.p. of sales and marketing), and Jared Bringhurst (director of manufacturing operations)—we gained a better understanding of the business model behind this aluminum extruder. Futura has utilized and modified a well-accepted business model, the Balanced Scorecard (BSC) to foster intense employee and customer loyalty. It is this modified business model that has made Futura stand out among other manufacturing companies in Utah. Futura has a reputation not only as a reliable and responsive soft alloy extruder but, more importantly, one that utilizes value-added operations creatively to solve customer problems.

Company Origin and Evolution

The original company, Colotyle, was formed in the early 1930s and produced a masonite wallboard product. In 1946, Colotyle became known as Colotrym, a company manufacturing aluminum extrusions. The marketing strategy for Colotrym was to fabricate cost-effective alternatives to stainless steel moldings and trims to serve the emerging post WWII demand in the U.S. for kitchen tables, shower doors, facing metals, coving, staircase metals, carpet bar, and other shapes.

Over the years, the company evolved into Futura Industries Company, a robust aluminum extruder and extrusion fabricator serving many markets. In 1964, Futura Industries was purchased by Robert Hansberger, founder, ceo, and chairman (20 years) of Boise Cascade Corporation. It continues to be closely held by his family to this day.

The company has been transformed under the leadership of Susan Johnson in the last 15 years, since she was selected by Robert Hansberger to serve as president and ceo. Today, Futura Industries is a leading custom aluminum extruder, providing thousands of products for a variety of customers in North America, Mexico, Austra-

lia, and Europe in many different markets. Additionally, Futura is the market leader in floor trims (carpet and ceramic tiles), providing their unique value-added extrusions to wholesale distributors worldwide. The company is focused on its strong culture, which concentrates on being reliable and responsive to customer needs as evidenced by its loyal customer base that expects not only quality aluminum extrusions but, more importantly, worthwhile solutions to their problems.

Capabilities and Value-Added Operations

In its Clearfield plant, Futura operates two medium sized, 7″ presses with 150 ft Granco Clark run-out tables (Figure 1). Both presses have automatic stretchers, and programmable saws operating up to 30 ft. One press is an 1,800 ton BLH press (Figure 2) and the other is an 1,850 ton UBE press (Figure 3). The bulk of the production utilizes purchased soft alloy billet, typically 6063 or other dilute 6xxx alloy composition, with chemistries adjusted for highly decorative finishing when required.

Value-added operations at Futura are what set it apart from commodity extruders. With over 100 separate work centers, the operations are extensive, consisting of what are considered conventional value-added operations—saw cut, machining, fabrication, finishing, and assembly—as well as specialized services described hereafter.

Saw cut operations are normally conducted on the high volume precision MetlSaw, which yields standard length and perpendicularity tolerances of ±0.005″ per inch of thickness cut, as well as on precision miter saws and other chop saws. Special tolerances are required for cutting solar panel frame sections, so Futura engineers built a separate cutting station to accommodate these sections (Figure 4), and a customized packaging system was developed to accommodate and ship these sections.

Figure 2. Pictured in the foreground downstream of the 7″ BLH press is a Granco Clark quench system.

Figure 3. Side view of 7″ UBE press.

Figure 4. Alejandra Melero at the solar panel frame cutting station.

Futura's machining capabilities are tailored for their markets, which include TSLOTS, a line of T-slotted aluminum extrusions used by engineers to build a variety of structures. They have several CNC mills: a Cincinnati Arrow 750 mill with a 30x20″ table, two Haas vertical mills each with a 50x20″ table, two Haas 4-axis horizontal mills (Figure 5) each with a 24x24″ table, two manual mills with table sizes from 44x9″ to 50x10″, and a manual lathe with a 42″ traverse. They also have a new Mazak vertical mill with conversational Mazatrol programming.

Futura machinists have over 50+ years of combined machining experience. Their experience is especially important in support of Futura's TSLOT business. TSLOT customers have a choice of several machining services: cut-to-length, tap profile end, drill access holes, counter bore anchor/butt fastening assembly, counter bore for miter cuts, panel notch for profile/fastener clearance, and deluxe door handle milling service. Hundreds of precision cut and machined sections, available in the Futura TSLOT catalogue, can be assembled into a variety of useful structures.

Other fabrication capabilities at Futura are extensive, with customized machines that include several press brakes with force capacities from 35 to 90 tons, a punch/countersink machine, automatic protective taping machine, two Pines benders, manual benders, two shapers for metal cutting, an automated punch/miter cutting machine, welders, riveters, and drill presses.

Futura really stands apart in its quality results. Rather than track traditional measures, such as plant scrap and Return Merchandise Authorizations (RMAs) it has a company-wide metric of First Pass Yield (FPY)–how much product gets produced correctly the first time. FPY is a measure more common to the automotive industry and

Figure 5. Susan Johnson, president and ceo of Futura (right), works with Aaron Bowers to inspect and gauge an extrusion recently machined on one of the company's CNC mills.

measures scrap, rework, and returns as one metric. Futura's FPY was 98.74% in 2009 and 98.6% in 2008. Consistent lead times and on-time delivery are critical to maintaining the company's 99% customer retention rate. FPYs are highly correlated with high levels of on-time delivery. Ken Wells, vice president of sales and marketing, pointed out that a return from a customer is treated very seriously at Futura, calling it "a heinous event."

Decorative Finishing

Specializing as it does in highly decorative finishes, Futura has invested in a modern and efficient electrochemical anodizing line that can accommodate extrusions up to 24 ft in length (Figure 6) or short fabricated sections (Figure 7), and produces a full color spectrum that includes architectural anodizing (Figure 8), bright dip, and marine finishes. This anodizing line utilizes acid etching, which yields better color and is more environmentally friendly compared with traditional alkali etching with caustic soda solutions.

Futura offers many other finishes and coating capabilities including: electroplating, powder coating, silk screening, masking/stenciling, and chemical film coatings. There are separate finishing stations for abrasive disc, belt, and flap wheel brushing, de-burring, and ultrasonic and chemical cleaning. The wide range of finishing capabilities makes it possible for Futura to offer its customers as many as 20 types of finishes on its floor trim products.

Figure 6. Taylor Sanchez is racking long extrusions in preparation for anodizing.

Figure 7. Fabricated truck grill extrusions racked in preparation for anodizing.

Figure 8. Anodized extrusions coming out of the anodizing tank.

Product Assembly and Custom Packaging

Product assembly is another value-added feature of Futura's business. As an example, Figure 9 shows a specialized enclosure developed for a customer by Futura utilizing its TSLOT extrusions and assembly system; the enclosure walls and flooring are custom packaged in kits and shipped for assembly at a customer location.

Figure 9. A specialized enclosure assembled at Futura prior to packaging and shipping, utilizing their TSLOT extrusions and attachments.

Customized packaging is often necessary for fabricated and finished extrusions that serve special customers and purposes (Figure 10). In the case of its floor covering trim line, Futura has developed a reusable plastic injection molded end cap (patent pending) for the cardboard tube packaging of its products (Figure 11). The conventional stamped steel end caps require hammers, even hacksaws to access the trims inside the tube, and the edges can cut exposed fingers. The easy-to-use Futura end caps are opened by squeezing a tab and popping the cap out of the tube. They can be easily recapped, and are also color coded to easily identify the floor trim product.

Just-in-Time Programs

Just-in-Time (JIT) programs at Futura, some offering a 48-hour guarantee of delivery of product, are implemented through a dedicated lean production system that incorporates well-maintained billet and die inventories, tightly scheduled extrusion press operations, a controlled plant inventory that relies on *pull vs. push* material flow, and elimination of waste. However, a major part of the success of Futura's JIT programs is their 110,000 square feet of warehouse that stores extrusions and readies them

Figure 10. Customized packaging of fabricated extrusions with plastic and paper sleeving, separating fabricated product.

Figure 11. Injection molded end caps, designed by Futura, for custom packaged floor covering trim.

for shipment. Thus, Futura is able to offer JIT delivery on all of their catalogued items (Figure 12). Altogether, the company's industrial, floor trim, and TSLOT catalogues list hundreds of products. Their 48-hour guarantee on floor trim products has been made possible through lean manufacturing efforts.

Figure 12. Futura's warehouse, located adjacent to their Clearfield plant, stores extrusions for their Just-In-Time program.

TSLOT product storage includes space for TSLOT shapes (Figure 13) and a separate storage room for TSLOT accessories—such as brackets, joining plates, joining strips, T-nuts, a variety of fasteners, various hinges, pivot arms, nubs, slide tracks, linear bearings, hardware, panels, etc. (Figure 14). TSLOT kits can be quickly packed for delivery from this inventory.

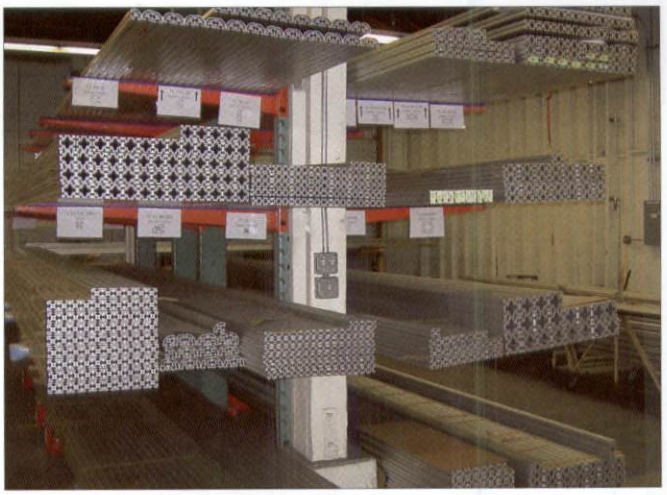

Figure 13. TSLOT 6063-T6 extruded shapes racked and ready for packing and delivery.

Figure 14. TSLOT joining plate bins in the accessory storage room.

The Futura Family

On the day of our visit to Futura, Jared Bringhurst, director of manufacturing operations, led the tour of the plant and warehouse operations. He chatted amiably with employees in English as well as Spanish, while they described their mission and brought us up to speed on their day's work.

As impressive and efficient as Futura's physical plant and operations are, according to Futura management, the real success of the enterprise depends on the culture of the company. In large part, this is due to the implementation and tailoring of the BSC management system in all of their operations. Basically, the BSC balances the financial aspects of a company with customer perspective, internal perspective, and learning. Although widely used worldwide by companies such as GE, DuPont, Siemens, Caterpillar, etc., Futura has tailored the BSC to fit the special requirements of their aluminum extrusion and value-added business operations.

Staff involvement and "buy-in" of employees are critical to the successful implementation of BSC within a company. In Futura's case, employees and staff must work in teams on their lean and flexible manufacturing programs to serve their customers well with the variety of custom solutions that Futura offers. This is done through development and qualification in standardized work programs, team metrics and performance, educational assistance programs, and the Futura performance pay system, all designed to foster a culture of respect and accomplishment.

Interview with Susan Johnson, president and ceo, Futura Industries

Creating the Futura Culture

Susan Johnson

A registered professional engineer in Oregon and California, Susan Johnson originally received her Engineering degree from California Polytechnic in San Luis Obispo, and later attended UC Irvine and Santa Clara University. Prior to her 15-year tenure as president and ceo of Futura Industries Corporation, she served at the helm of Savage Industries and Daw Technologies, now wholly owned subsidiaries of Mack Trucks. Under her leadership, Futura has grown. Even during the economic downturn of the last two years, the company has been able to maintain profitability and a strong cash flow. In fact, the company has returned "best of class" earnings for an organization in any industry during this time, let alone a company involved in aluminum extrusion and metals manufacturing. *Light Metal Age* had the opportunity to interview Susan to find out more about Futura's management style and company culture in greater detail.

Is Futura's culture based on any particular management system or style, or is it unique to your company?

Every company's culture is unique to them and is driven by a whole multitude of factors. For us a great culture means engaging, challenging work, a safe work environment, an opportunity to learn and grow for everyone, a bias towards action, and one where everyone "owns the mission." If these factors are present, we believe that we will attract and retain a loyal and profitable customer base. Take care of people first, we believe, and the bottom line will take care of itself!

The numbers are the ultimate test; we just happen to believe that the best numbers are achieved by building a responsive company culture. It's simple: customers have needs, so you build an organization that can meet those needs superbly well. That's our strategy for delivering great customer value.

We adopted the Balanced Scorecard (BSC) management system about 12 years ago and manage our business through its use. Philosophically, this says that if you build a strong foundation of robust systems and people, then the internal/operational performance will be strong, which will give you satisfied and therefore loyal customers. From this, robust and long-term profitability will follow, thus resulting in increased shareholder value. On our BSC, we have two primary strategic pillars: market expansion and world class execution. Another innovative way we manage our business is through the use of standardized work. This systematic approach to production ensures that a product is made the same way each and every time, using a standardized "recipe" for perfection.

What metrics are used at Futura for assessing the benefits of your Balanced Scorecard and production management systems to customers, employees, and shareholders?

The Balanced Scorecard is a compilation of all our business metrics. The top metric is the Customer Satisfaction measure. From there we move down through Customer Level and Internal Level measures. Finally, there is the foundation of all our success: our Learning, Innovation, and Growth Layer, which measures the success of our people and our systems. We believe that not only do people want to feel good at work; they also want to feel strong through accomplishment, both personal and as a team. To nurture our culture of accomplishment, we've created a unique microclimate where everyone knows their daily goals—for themselves, their teams, and the company as a whole. And with monthly, performance-based bonuses, meeting those goals means tangible rewards. Last year in our plant, the average incentive pay was $2,500.

How does the Futura production system work? Is it a separate management system from the Balanced Scorecard system?

We are an ISO 9001:2008 registered company, seeking continuous improvement in our manufacturing processes, which is a trademark of other production systems. We work vigilantly to maintain the outstanding quality, delivery and lead-times we have achieved over the years. We audit our processes at every level to assure that we're following standardized workflow with little or no variation. Continual audits allow us to catch process control discrepancies before they spiral out of control, and to fix them before they become problems. It's why our factory consistently wins major manufacturing awards—and it's why our customers always get the fastest delivery, the highest quality, as well as a great price. We focus on execution, because we've seen organizations that do strategic planning, but do not execute their plans strongly.

How and why does Futura put so much emphasis on employee satisfaction and initiative?

If you treat employees with trust, decency and yes, generosity, the company will benefit in ways beyond imagination. Remember that every day, every member of a company makes hundreds of decisions that affect customer satisfaction. You cannot possibly manage all of those decisions. Hire the right people, trust them, and take care of their needs, you'll be amazed. The Futura culture provides employees with engaging and challenging work and an opportunity to learn and grow. We start by hiring what we call R2 (Reliable/Responsive) people as employees and train them to be biased toward action. As far as employee satisfaction is concerned, about 60% of our employees have more than ten years of tenure, and Futura has been awarded recognition as one of the best places to work in the state for the last ten years, more than any other organization receiving the award. By taking care of our people, we attract and retain a loyal and profitable customer base. We've made our business all about our customers but execute this by making our company all about our people.

As Futura has been somewhat of a pioneer in the industry in how it deals with employee health benefits, can you explain how your health benefit system works?

One of the absolute best and most unique things that Futura has done is the establishment of our own on-site medical clinic in early 2007 for our 300 employees and their families. It was our hope that we would be able to deliver much better health care for our employees and their families than is generally available. It was not intended as a replacement for traditional health insurance, which we still provide, along with company-supplied Health Reimbursement Accounts (HRAs). The clinic represents a large investment in the continued well-being of all of our people—and their families.

Our MD in internal medicine, Dr. Donna Milavetz, is committed to increasing the health of our people. With a bilingual medical assistant on her staff, many employees report that they and their family members have access to quality medical care for the first time. The results have been nothing short of miraculous. At the clinic, wellness care and maintenance are obviously front and center of our activities. However, chronic disease, identification and management is Job #1. Chronic conditions, such as diabetes and heart disease are the drivers behind poor health outcomes for our country, as well as driving healthcare costs up, up, up!

The Futura Medical Clinic is open to all employees and their families, and most visits are free. Additionally, our doctor-recommended wellness programs—like smoking cessation treatment—are underwritten by Futura. Such a major health care undertaking is unusual for a company of our size, but we believe it's vital. By providing comprehensive, quality health care for our people and their families, the Futura Medical Clinic has significantly improved our employees' lives. And the bottom line for our healthcare costs? Over the last four years, including the costs of operating the clinic, our healthcare expenditures as a company have dropped.

Do you have any thoughts on the challenges posed by globalization of the extrusion industry, especially as it affects North American extruders and, of course, Futura Industries Corporation?

The North American aluminum extrusion industry has been hit hard over the last three years and not just by the economic slowdown. Chinese aluminum extruders have made exponential inroads into capturing market share in both the U.S. and Canada. Their sales into our markets focus on gaining market share at any cost. This has obviously hurt many domestic extruders. During the last three years, 50-60 aluminum extrusion-manufacturing plants in the U.S. and Canada have closed their doors and ceased operations.

Do you see an economic recovery this year? What are the business plans for Futura's future?

For us, 2010 is on track to better profitability over 2009. We will continue aggressive expansion in specific markets. Through our detailed methodology for filtering potential customer leads, we will seek out customers whose needs are not easily fulfilled by other aluminum extruders. Customers that require a high level of attention to detail, tight tolerances, short lead times, small shipments, and exacting fabrication and machining requirements are usually very satisfied with our offering.

The Futura culture empowers employees to own the mission with a bias towards action.

Metallurgical Aspects of 6xxx Alloys, Part II

Impact on Homogenization, Preheat, and Extrusion Processes

By J.D. Schloz, Viking Metallurgical LLC, and Richard M. Kelly, Richard M. Kelly LLC

Summary

The present overview is the second in a two-part series summarizing the origin and development of metallurgical characteristics in aluminum alloys that contribute to undesirable extrusion features that may be encountered in a typical extrusion plant. The focus of this article is on alloys of the 6xxx alloy series family.

Reducing operational cost and improving billet-to-extrusion processing efficiencies through the avoidance of problematic or limiting material characteristics are regularly pursued in extrusion plants. Though many of these anomalies may be repeatedly encountered and are generally understood on a physical level, the knowledge and understanding from a metallurgical standpoint—both the origins and development through processing—may not be comprehensively recognized in all areas of the industry.

This article provides an overview of the metallurgical characteristics developed after casting, and how certain key components of the billet coupled with extrusion processing—such as homogenization and preheating practices—affect the material on a microstructural level. Certain physical process limitations are also discussed as they relate to key microstructural elements within the extrusion billet.

Introduction

The production of aluminum extrusions involves a number of challenging processes, which all have impact on the final product's appearance, suitability for processing, and performance as a finished material. It is to the manufacturer's advantage to understand the role that key microstructural elements play in determining not only the material's processing characteristics, but also the properties of finished extrusions.

Of the many issues that arise in the homogenization and extrusion processes, some result from the condition of the as-cast billet microstructure. These effects were detailed in the authors' previous article, and the reader is encouraged to review Part I in order to understand the importance of the starting condition of the extrusion feedstock.

Though many of the important characteristics originate in the cast billet, there are also many opportunities to affect the suitability for processing in the homogenization, preheat, and extrusion steps. Knowing the relationships between subsequent processing of billet—and the resulting microstructures that are created—is a primary tool in optimizing these processes and the final properties of the extrusion.

Metallurgical Aspects of 6xxx in As-Cast Billet Feedstock

In Part I, a more complete description of the billet microstructural elements was presented. For purposes of the present article, we will narrow our discussion to the key elements that are most likely to affect the processes downstream of the casting operation.[1,2]

Mg_2Si Phase: The primary strengthening phase in 6xxx alloys, Mg_2Si, has the largest impact on subsequent processing. The control and manipulation of the phase's crystal structure, size, and distribution forms the basis of homogenization, preheat, and extrusion processes. In as-cast billet, it is desirable to have these phases as small and well distributed as possible.

AlFeSi Phase: As discussed in Part I, there are two varieties of AlFeSi—the more desirable α-AlFeSi phase, and the less desirable β-AlFeSi. While the casting process may affect these, billet chemistry is the single largest variable, particularly the Mg:Si ratio (balanced or excess-Si) and the amount of Mn in the alloy. In as-cast billet, it is desirable to maximize the alpha phase and minimize the size and quantity of the beta phase.

Grain Size and Dendrite Morphology: These two seemingly different metrics are conveniently grouped together because it is the combination of grain boundary area and grain volume that determines the response of the material to post-cast processing, particularly in the response of the material to thermal treatment. Large grains with coarse secondary dendrite arms result in a microstructure that is more difficult to manage, whereas small grains with fine dendrite arms will be much less challenging. This is more an issue of secondary phase (Mg_2Si and AlFeSi) manipulation than of the dendritic structure itself.

Shell Zone: Though methods of determining and specifying shell zone vary widely, they all relate to the chemical, crystallographic, and physical aspects of the billet's outer regions. The severity of shell zone variability will affect thermal processes, as well as mechanical behavior and extrusion recovery (particularly in profiles with high reduction ratios), and it is desirable to minimize both the depth and severity of this non-uniformity.

Exogenous Particles: The presence of particles that are "not of the melt" is entirely unavoidable in cast billet. While many of these particles reside in the incoming metal (scrap and prime metal, as well as alloy additives), many are created in the casting process. One particle in particular, TiB_2, is an intentional addition, but for the purposes of post-cast processing it is considered a metallurgical defect, especially with regard to its effects on extrusion finish. Part I discussed the proper use of TiB_2 rod products, and it can be said that minimizing their addition is generally helpful in retaining good finishing properties.

Process Overview – Homogenization, Preheat, and Extrusion

Homogenization: The purpose of homogenization is to manipulate the billet's internal structure so that it is homogenous on a microstructural level. From a microstructural standpoint, both the Mg:Si phases and AlFeSi phases are altered. In the case of Mg:Si phases, these are dissolved during the heatup and soak times, and subsequently reform during cooldown. Regarding AlFeSi phases, these are not dissolved, but the chemical and crystallographic structure is first altered from the plate-like β-AlFeSi to the more rounded α-AlFeSi. The resultant alpha phase will then, over time, break up, or *spheroidize*, creating fields of more or less rounded particles in the space previously occupied by the original phase. In addition to the two main particles of concern, any dispersoid-forming elements (e.g. Mn or Cr) will nucleate during the heatup and hold periods to form very small particles.

Of the variety of designs and layouts for homogenizing billet, they will be of one of two types: batch or continuous. The advantage of batch type furnaces is that they