CASTOOL™
TOOLING SYSTEMS

NEWSLETTER

MARCH 2022

A DISRUPTED RECOVERY, AND HIGHER INFLATION

The global economy enters 2022 in a weaker position than previously expected. As the new Omicron COVID-19 variant continues to spread some countries have reimposed mobility restrictions. Other countries however are lifting restrictions, learning to live with COVID. But just as much of the world was preparing to put COVID behind it, war has broken out in Europe, creating additional uncertainty. Rising energy prices and supply disruptions have resulted in higher and more broad-based inflation than anticipated, notably in the United States but also in most markets around the world.

Global GDP growth is expected to moderate from 5.9% in 2021 to 4.4% in 2022- then is expected to slow to 3.8% in 2023. The forecast assumes, vaccination rates continue to improve worldwide, and therapies become more effective.

Elevated inflation is expected to persist for longer than envisioned, with ongoing supply chain disruptions and high energy prices continuing in 2022. While this creates a challenging environment, we at Castool have the right elements to continue to thrive. Demand for our various products remains strong, we have very talented people and culture geared for success. I know we will meet the challenges ahead of us in 2022 by doing what we do best - continuing to innovate and becoming ever more efficient.

Paul Robbins
General Manager

RISKS TO THE GLOBAL BASELINE ARE TILTED TO THE DOWNSIDE:

The emergence of new COVID-19 variants could prolong the pandemic and induce renewed economic disruptions. Moreover, supply chain disruptions, energy price volatility, and localized wage pressures mean uncertainty is high around inflation and policy paths, with debt levels having increased significantly in the past two years, and as advanced economies lift their policy rates, there are risks that may emerge. Especially at risk are financial stability; emerging markets; and developing economies capital flows, currencies, and fiscal positions. Other global risks may crystallize as geopolitical tensions remain high; and the ongoing climate emergency means that the probability of major natural disasters remains elevated.

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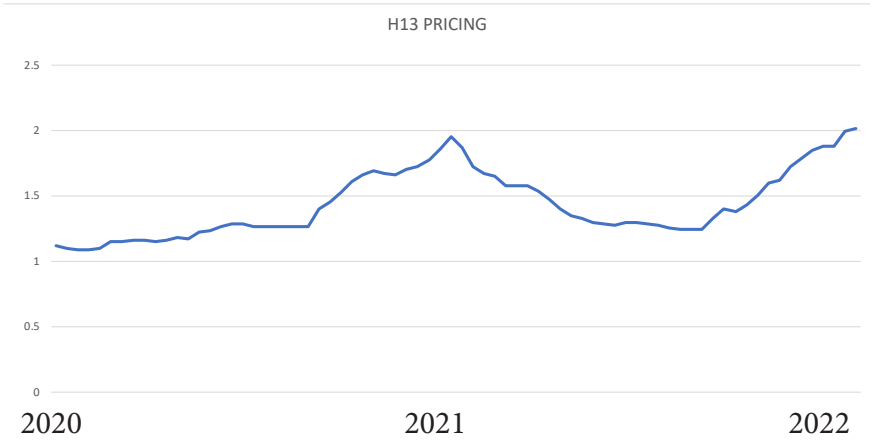
MATERIAL COSTS 2020 - 2022

Input Costs

The input costs have been steadily increasing in 2021, compared to 2020. Scrap prices have increased, as well as the main alloying elements Chrome (FeCr), Molybdenum (FeMo) and Vanadium (FeV). As of November 2021, the mills also started charging an energy surcharge, due to the high cost of electricity.



H-13, which is our main material used for extrusion and die cast tooling and has steadily increased in price since 2021. We are hoping that prices will level off or decrease in 2022, but no relief seems to be in sight.

Material represents approximately 50% of our costs, and any increases are being passed on to our customers. Most customers are aware of the current situation, and have been very receptive and supportive.

We are also experiencing increased costs in other areas, including tooling and logistics. In many cases, the price increases come at the same time as poor service and ridiculous lead times.

We will do our best to manage the impact on our customers, but ask that you are reasonable. Our apologies, but we are all in this situation together.

Month	Scrap busheling ($/T)	Ni ($/LB)	FeMo ($/LB)	FeCr ($/LB)	FeMn ($/LB)	FeV ($/LB)	FeSi ($/LB)	Copper ($/LB)
Dec 20	$379	$7.65	$10.69	$0.90	$0.55	$11.06	$0.87	$3.53
Jan 21	$482	$8.12	$11.50	$0.98	$0.58	$12.83	$0.97	$3.62
Feb 21	$482	$8.44	$12.78	$1.11	$0.69	$15.11	$1.07	$3.83
Mar 21	$551	$7.49	$13.10	$1.23	$0.73	$16.23	$1.15	$4.11
Apr 21	$551	$7.50	$12.50	$1.25	$0.72	$16.00	$1.22	$4.23
May 21	$551	$8.00	$14.48	$1.26	$0.73	$16.01	$1.29	$4.62
June 21	$610	$8.15	$19.18	$1.28	$0.79	$16.63	$1.38	$4.36
July 21	$630	$8.54	$19.85	$1.36	$0.79	$17.29	$1.68	$4.29
Aug 21	$630	$8.69	$21.08	$1.66	$0.96	$17.19	$1.76	$4.25
Sep 21	$590	$8.78	$21.48	$1.68	$1.05	$16.55	$2.01	$4.23
Oct 21	$570	$8.78	$21.69	$1.80	$1.12	$14.47	$3.14	$4.37
Nov 21	$590	$8.99	$21.50	$2.05	$1.14	$14.78	$3.23	$4.35
Dec 21	$590	$9.04	$20.74	$2.20	$1.14	$14.91	$2.97	$4.32
Jan 22	$530	$9.98	$21.31	$2.10	$1.12	$16.51	$3.00	$4.42

2021 Swiss Steel Alloy & Scrap Surcharges (US$/LB) Jan 06, 2022

Grade	DIN	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2022-01-01
H13	1.2344	$0.82	$0.90	$0.88	$0.93	$1.00	$1.08	$1.12	$1.22	$1.28	$1.34	$1.38	$1.38	$1.49

CASTOOL TOOLING SYSTEMS is a world leader in the tooling systems and among the first in the industry to be certified with the prestigious globally recognized standards: ISO 9001:2015 quality management system, ISO 14001:2015 environmental management system, and the occupational health and safety ISO 45001:2018; since those standards combine risk-based thinking and process approach, ISO 31000:2018 Risk Management is used as a guideline.

To provide consistency within Castool Tooling Systems and streamline its operations worldwide, the company integrated all those standards into one management system (Castool-IMS) and implemented it globally in Castool 180 in Thailand (Certified) and Castool 90 in Morocco (Soon to be certified).

Castool-IMS provides a powerful management system throughout Castool's global operations.

ISO-based standards provide a global approach to management. They also require the identification and implementation of local product, labor and environmental rules and regulations.

Castool-IMS helps us demonstrate to our customers that we are able to offer products and services of consistently good quality. It allows us to adapt in a changing world. It enhances our ability to satisfy our customers and provides a coherent foundation for growth and sustained success.

Castool Tooling Systems anticipates several advantages of the ISO's high-level-structure, integrated management systems. These include:

- Process-based;
- Considers hazards, risks (incl. organizational risks), and opportunities including the views of all interested parties;
- Greater emphasis on top management engagement, and on improved alignment between management systems and the strategic direction of the organization. These should be an integral part of our business' processes;
- The adoption of risk-based thinking, giving opportunities to differentiate between the various processes based on their level of importance and impact on delivering conforming products/services. This will allow us to focus on key priorities;
- Widening the concept of customers to include (in addition to the contractual customers) end-users, consumers, regulatory bodies, etc. This allows the definition and expectations of interested parties to be addressed;
- Adopting high-level structure, facilitating the harmonization and integration of different management system standards ;
- Lessening the requirements for documentation, enabling us to decide on what matters most to our operation and to learn how to manage and control it in an era where automation and smart systems play an increasing role in management.

THE CASTOOL STORY

Evolving Tooling Technology

Castool's origins begin with Harry Robbins, a toolmaker who specialized in making high-quality dies for aluminum extruders, first in his basement, in his garage,then for Corman Engineering, always assisted by his wife, Audrey. In 1952, he opened his own shop in Toronto and called it the Extrusion Machine Corporation: a small company with a big name, since they started with only 7 employees. By the early 1970s, Harry's two eldest sons were involved. Extrusion Machine Co was split into two entities: Exco (extrusion dies) and Exco Engineering (die cast molds). In the early 1980s, Castool was broken off as another separate entity. In 1986, the third son, Paul Robbins took over the sales, marketing and product development.

Castool was soon making custom tooling for anyone who was prepared to pay for precision work with short lead times and dependable deliveries. At that time, Castool was not specialized but with the relationship to Exco and Exco Engineering – who are now recognized industry leaders in extrusion and die casting. Castool had a close association with these two industries, and the company realized that no single supplier provided a comprehensive range of support tooling for either.

Originally, Castool's management decided to concentrate on the support tooling required by extruders and die casters, but the spotlight soon focused on R & D. The predominant attitude was that there was no reason why the company couldn't either develop or obtain the rights to the very best tooling products available. At the time – according to Paul Robbins, who became General Manager in 2002 – this appeared to be rather presumptuous for a company of its size, but the small team embraced the challenge.

Castool is a division of Exco Technologies Limited. It was first established in the early 1980's in Scarborough, Ontario. In 2006, a new 40,000 sq ft facility was built now expanded three times to 80,000 sq ft on the outskirts of ***Uxbridge, Ontario*** – a small, historic town about one hour northeast of Toronto. It is now the head office, design and manufacturing plant for Castool Tooling Systems, employing approximately 140 skilled people, and servicing the global aluminum extrusion and die cast industries. About 90% of these sales are exported from Canada and 70% are related to Automotive.

CASTOOL180

In 2014, Castool expanded to Thailand. The facility is approximately 35,000 sq ft, employing 40 skilled people, and enables Castool to better serve its fast growing market share in Asia for consumable tooling from a proximate location.

Located in ***Chonburi, Thailand***, this facility has been named Castool 180 because it is exactly 180 degrees around the world from Castool in Uxbridge, Ontario. Castool 180 is expected to grow to 100 employees in the next few years, with a square footage reaching 60,000 sq ft.

The "180" plant is similar to Canada in all facilities

CASTOOL90

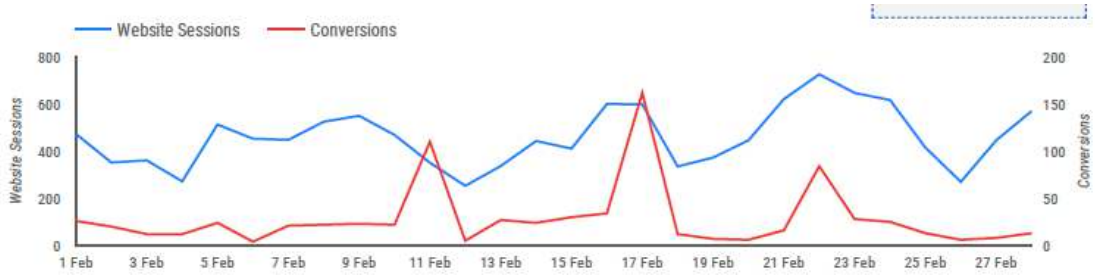
In 2020, Castool expanded to ***Kenitra, Morocco.*** The facility is approximately 35,000 sq ft, employing 35 skilled people, and enables Castool to better serve the European, Middle Eastern and African markets.

The "90" plant is similar to Castool's other facilities, but with added 40-ton lifting and machining capabilities.

Castool 25 in ***Queretaro, Mexico*** is now starting construction, and will be discussed later in the newsletter.

UPDATED WEBSITE AND GOOGLE ADS

We started working on ad campaign in January 2021. We saw a strong start to the campaign in January and February. It tapered off through the spring, and then came back in the summer and fall. It started to taper off again as we closed out the year.



UPDATES:

- Our budget has been shifted to favour the Search ads vs the Performance Max ads, based on cost per lead.

INSIGHTS:

- Total conversion activity was down 9% last month, and we saw a 11% increase in our cost per conversion.
- We saw a 14% increase in PDF downloads.
- Our costs per click were down sharply for our Search campaign (26%), resulting in 18% more clicks.
- Our costs per click were up sharply for our Performance Max campaign (140%).
This resulted in 47% fewer clicks, and no conversions. As a result, we have shifted more of our budget to Search.
- The 25 to 34 year old age group remains our most popular, accounting for 29% of all ad clicks.
- We saw 399% more men than women engaging with the ads.
- Our most popular locations were Morocco, Thailand, Mexico and China.

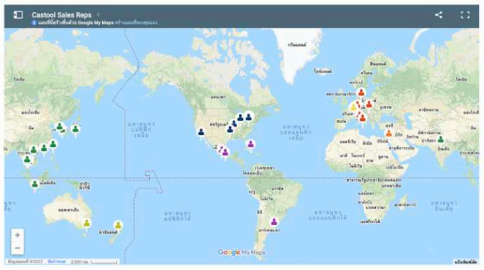
WEBSITE ANALYTICS INSIGHTS:

-Our website engagement metrics were down for the month:

- Average session duration was down 17%.
- Pages per session was down 2%
- Bounce rate was up 1%
- Our most popular pages were: Home, Die Casting, Extrusion, Contact, and About.
- The ad campaign was responsible for 22% of all lead activity, and 24% of all website traffic.
- Overall lead activity from all sources was down 5% for the month.
- Organic search traffic from Google accounted for 68% of all traffic.
- Over one-third of all visitors are between the ages of 18 and 24.
- We saw 25% more women than men visiting the website.
- The most popular countries from all sources were Thailand, US, Mexico, Morocco, and Canada.

We generated 9,700 PDF downloads, 370 emails and 274 phone calls through the ad campaign
The most popular headlines:

- *Additive Manufacturing*
- *Castool Tooling Systems*
- *Improve Die Casting Conditions*

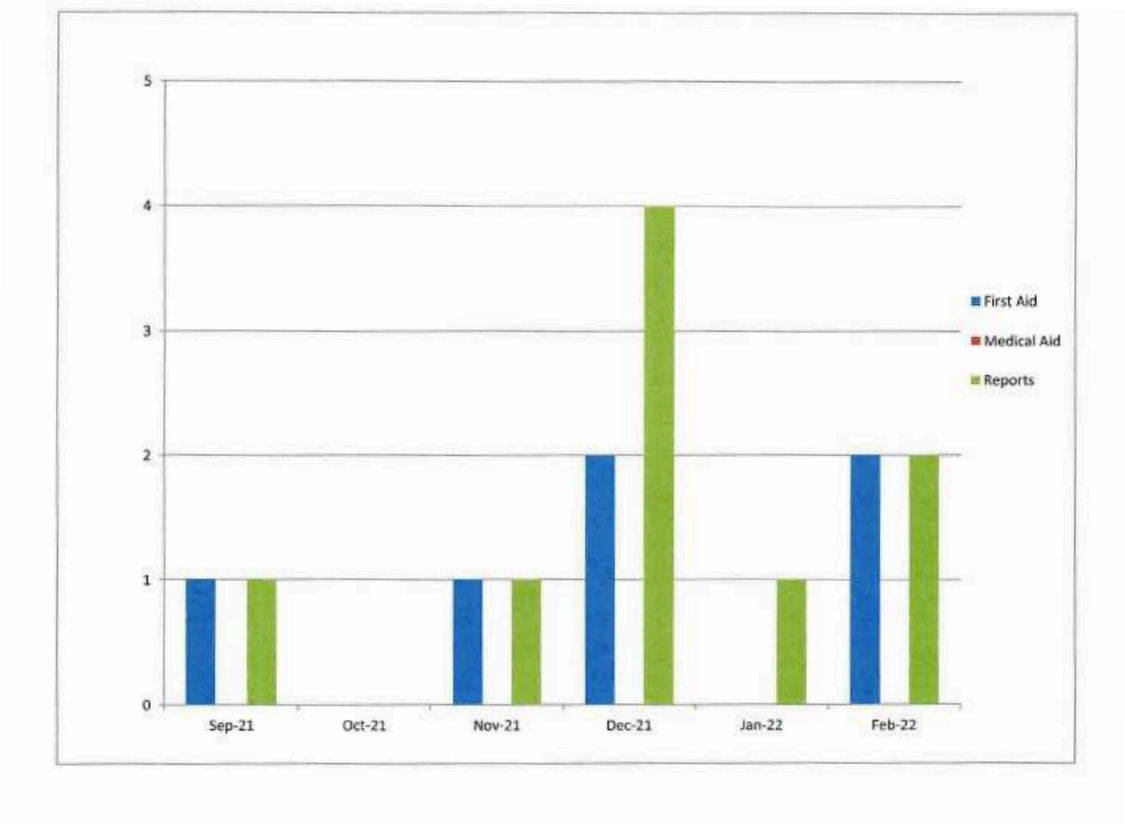


OCCUPATIONAL HEALTH AND SAFETY

Between the months of September 2021 and February 2022, Castool Tooling had 0 medical or lost time accidents. As of today, we have completed 6 months with no medical accidents which will set a new target record. Our Safety Incentive Plan continues to raise awareness amongst our employees surrounding risk vs reward.

Our Joint Health and Safety Committee have discussed all incidents to include updating Risk Assessments, Lift Device training, and Covid-19 Policy updates. This reduces both health risks and worker injury.

This report shows we have now gone over 6 consecutive months without a medical accident.
A great collective accomplishment!



Finally, during February, an ISO Surveillance Audit was completed for:

ISO 45001:2018
ISO 14001:2015
ISO 9001:2015

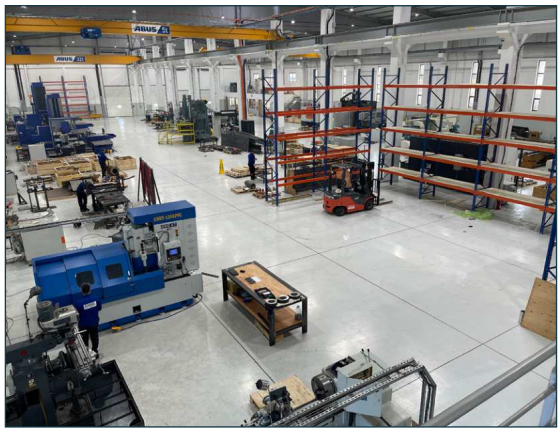
Our continued awareness, improvements and striving for results from a collective effort will make Castool a safer environment and healthy workplace for all Castool employees.

QUALITY SAFETY ENVIRONMENT

CASTOOL GROUP UPDATE

Castool has always endeavoured to lead the industry through education. We are constantly creating presentations, articles and webinars based on our research. Our goal is to gain knowledge for ourselves, while educating our customers.

KENITRA, MOROCCO



"My staff and I would like to thank you everyone for joining us today to celebrate the opening of Castool 90. I realize that many of you have travelled some distance to be here today, and respect and appreciate your efforts.

I would like to personally thank Siri, John Bouchebti our architect, Boumahdi and his son our supplier and freinds, KCI our builders and the multitude of others that helped us build and equip this facility during 2021. We put the first shovel in the ground early December 2020 (the peak of Covid 19) and completed the factory in 10 months.

We have successfully hired 18 bright and very skilled local employees. We expect to hire another 15 to 20 people in the coming months. As you can see, we have room to expand or double our size in Kenitra and expect to do so in the coming years.

Castool90 has been positioned in Kenitra, Morocco to better serve the European, Middle Eastern and African markets.

Our customers now want castings and extrusions that are bigger, more complex, and with closer dimensional tolerances than ever before with a perfect surface finish, absolutely no porosity and at an often ridiculously low price.

The good news is that the market for light metal die casting and extrusion tooling is growing at a healthy rate and Castool's technology for light metal die casting and extrusion tooling has kept pace with the changing demands and made it possible for die casters and exters and extruders to satisfy this challenging and difficult market.

We would like to thank you again for your attendance. Please feel free to ask any question you may have to my staff or myself, and enjoy the festivities".

Paul Robbins
General manager

Castool has dedicated heat treatment and nitride facilities in Canada, Thailand and Morocco. Each has 12-bar vacuum heat treatment furnaces capable of heat treating 15,000 lbs and vertical tubes up to 65" in length. We can nitride virtually any heat treated tool also in vacuum.

The adjacent vacuum oven is located beside our Kenitra facility.

HEAT TREAT NEWMARKET, CANADA

In Canada, Castool currently heat treats more than 2 million lbs. of H-13 a year. The volume, sizes and specifications reguired by the market are constantly increasing. With the recent use of Gigapresses to make aluminum automotive structural members, the maximum length of a shot sleeve has increased from 50" to 65", and is expected to increase again to more than 80". At the same time, extrusion presses are also getting larger. I wrote an article years ago called Bigger Presses - Bigger Problems, which focused on the challenges according to size.

Castool is working with Ipsen and Nitrex to equip a state-of -the-art heat treat facility in Newmarket, Ontario. The facility will start operation in spring of 2022, and will be fully operational by fall. We will offer vacuum heat treatment and nitriding services commensurate with the market demands.

QUERETARO, MEXICO

This week, Castool started construction on a facility in ***Queretaro, Mexico***. The land is current being prepared for foundations and infrastructure. The 35,000 sq ft facility will be capable of machining and handling 40-ton tooling. It will service extruders and die casters in Mexico, Latin America, and some large American customers.

We expect to build containers, reline containers, build shot sleeves and rebuild shot sleeves at Castool 25. We will also keep inventory of plunger tips, dummy block and lubricants for both industries.

CASTOOL™
TOOLING SYSTEMS

RESEARCH CORNER
LABORATORY

BY YAHYA

ARTICLES RECENTLY PUBLISHED

DIE CASTING ENGINEER, JANUARY 2022;

Better Castings Faster: Tooling Material, Process and Failure Analysis in Die Casting

Abstract - The purpose of this paper is to discuss the materials available for manufacturing die cast tooling. In addition, this paper will outline a decision theory considering key parameters such as tooling life, cycle time and cost. Tooling failure and the process are discussed as being the main reasons for failure. Case studies using simulation and practical experiments are supplied to validate the theory.

LIGHT METAL AGE, DECEMBER 2021;

Material Selection for Extrusion Tooling (Part II): Steel and Design Choices for Improved Container Life

Abstract - This paper will discuss the most important aspects of material selection for extrusion tooling in detail. Correct material selection and proper heat treatment for tooling are vital factors of profitability. A good decision theory must consider different aspects and variables, including cost, longevity, cycle time, recovery, energy, health and safety, and environmental impact. All tooling fails at some point; the questions to ask are how long it lasts and why it fails. The processes that are mostly to blame for premature failures include improper temperature, cycle time, alignment, pressure, and lubrication. Next come design-related issues, such as strength, thermal management, lubrication, and wall thickness. Making a design change at little to no cost is often the best solution for these problems. As a last resort, alternative materials may exist to offer better protection and extend useful life with better strength, conductivity, wear resistance, and other factors. Finally, it is necessary to avoid overspending on tooling materials by optimizing a combination of variables: cost, longevity, ram speed, and recovery. Simulation is a powerful tool for material selection, evaluation, and optimization of the tooling before committing to the final design.

ALUMINUM INTERNATIONAL TODAY, NOV 2021;

Better Profiles Faster: Material Selection for Extrusion Tooling

Abstract - Correct material selection and proper heat treatment for tooling are vital factors of profitability. A good decision theory must consider different aspects and variables, including cost, longevity, cycle time, recovery, energy, health and safety, and environmental impact. All tooling fails at some point; the questions to ask are how long it lasts and why it fails. The process is mostly to blame for premature failures such as improper temperature, cycle time, alignment, pressure, and lubrication. Next come design-related issues such as strength, thermal management, lubrication, and wall thickness. Making a design change at little to no cost is often the solution for these problems. As a last resort, alternative materials may exist to offer better protection and extend useful life with better strength, conductivity, wear resistance, and other factors. Finally, it is necessary to avoid overspending on tooling materials by optimizing a combination of variables: cost, longevity, ram speed, and recovery. Simulation is a powerful tool for material selection, evaluation, and optimization before ever committing.

LIGHT METAL AGE, OCTOBER 2021;

Material Selection for Extrusion Tooling (Part I): Maximum Longevity, Improved Productivity, and Lower Cost

Abstract - This paper will discuss the most important aspects of material selection for extrusion tooling in detail. Correct material selection and proper heat treatment for tooling are vital factors of profitability. A good decision theory must consider different aspects and variables, including cost, longevity, cycle time, recovery, energy, health and safety, and environmental impact. All tooling fails at some point; the questions to ask are how long it lasts and why it fails. The processes that are mostly to blame for premature failures include improper temperature, cycle time, alignment, pressure, and lubrication. Next come design-related issues, such as strength, thermal management, lubrication, and wall thickness. Making a design change at little to no cost is often the best solution for these problems. As a last resort, alternative materials may exist to offer better protection and extend useful life with better strength, conductivity, wear resistance, and other factors. Finally, it is necessary to avoid overspending on tooling materials by optimizing a combination of variables: cost, longevity, ram speed, and recovery. Simulation is a powerful tool for material selection, evaluation, and optimization of the tooling before committing to the final design.

ARTICLES (EXTRUSION)

COMING SOON

ET-2022

Extrusion Productivity – Billet Geometry/Container/Dummy Block

Abstract - This paper studies the impact of process parameters on press productivity. In particular, 3D simulations have been performed to determine the effect of billet geometry (that is primarily billet length and diameter) on press load, extrusion temperature and mode of deformation in the billet. Such simulations are shown to be invaluable to the extruder to allow him to optimize the container dimensions, tooling and die design which leads to maximizing productivity.

Extrusion Productivity – Ram Speed /Die Design/Container

Abstract - Often, we see extruders who are producing very similar profiles with conventional die designs with well-known alloys and all that they can do is guess based on previous performance and experience. Ram speeds are often very different. Performance and productivity become a measure of confidence rather than scientifically based numbers. Our hope is that first we can predict maximum ram speed based on the current billet, available press load and tooling, in particular the container design and materials and the die parameters. Then, we can suggest to extruders to use the right container design and material, container set temperatures and billet temperatures to further improve their productivity. In this paper a combination of statistical design of experiments, finite element simulation, regression analysis is used to find the maximum ram speed (maximum productivity) for any given combination of process parameters by looking at the effect of those parameters on exit temperature and extrusion loads. Then the optimized combination is found within the defined range of parameters. Several parameters are considered including; container set temperature and taper, container conductivity, outside cooling rate of the container, billet preheat, billet dimensions and die design. The results show that the optimum productivity can be achieved with better cooling and container conductivity, larger billet dimensions and easy to push die design. In the optimum case both exit temperature and extrusion load are at the maximum set limit. It is interesting that the lowest productivity is achieved with the same combination of parameters except with a hard to push die design where the press load capacity is the limit and extrusion exit temperature is far below the defined limit. With a conservative process parameters such as insulated container, low conductivity (high strength) container, short billet and hard to push die, the optimum productivity is 25 percent less than the global optimum, but the worst productivity with a conservative recipe is most probably higher than the global minimum.

A Fine Balance: the Difference Between Excellence and Mediocrity

Abstract: Extrusion management teams often ask similar questions: "We have great equipment. Why can't our dies produce a profile within tolerance? Why can't our die correctors get our dies running faster? Why do we struggle to achieve mechanical properties sometimes? Why is it so hard to be successful in this business?" Extrusion is a balancing act between people and technology systems; it is full of trade-offs and highly dependent on the physical realities of the tooling, equipment and processes. Excellence seldom results from doing excellent things, but rather from doing ordinary things with an excellence mindset. Certain key parameters, if left uncontrolled, will inhibit progress, irrespective of the effort put into the rest of the processes. Some extruders have cycled upwards through learning and development toward world-class results, only to drop to, or below, average industry levels. The authors use their decades of differing extrusion experience to highlight which focus areas result in performance growth or decline. It takes both technical expertise and exceptional management, working together, to succeed. The paper will NOT cover every element of an extrusion company, but will provide key insights and recommended areas of focus.

LIGHT METAL AGE, APRIL 2022

Material Selection for Extrusion Tooling – Part III: Die, Dummy Block, Stem and Auxiliary Tools

Abstract - This article is the last part of a series of three. The first article dealt with decision theory and most important aspects of material selection for extrusion tooling [1]. The second one was focused on material selection for containers [2] and the current article will continue with discussing the material selection for the rest of extrusion tools specifically die, dummy block, clean-out block and stem. Among these, dies and dummy blocks are in direct contact with deforming workpiece and under more sever mechanical and thermal conditions. Stem is not in direct contact with workpiece, and it does not experience high temperatures. Clean-out block is an auxiliary tool used after the main process to scoop off the remaining of billet skin on liner ID and clean the liner.

ARTICLES (DIE CAST)

COMING SOON

DIE CASTING ENGINEER, MAY 2022

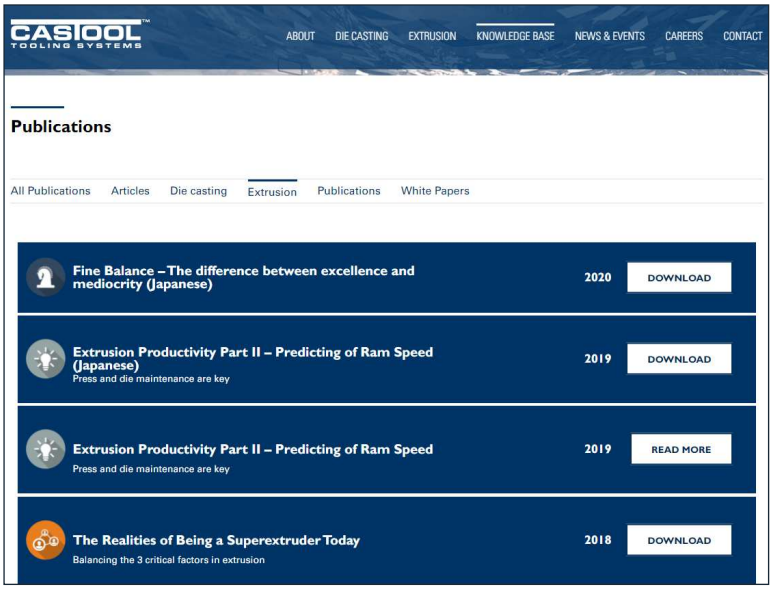
Plunger Tip Evolution in the Diecast Industry

Abstract: This paper reviews the evolution of water-cooled plunger tips and discusses available design improvements, optimizations, material selection, and manufacturing methods. Evaluating overall performance is done by utilizing computer simulation based on water flow, cooling rate and biscuit formation. Computational Fluid Dynamics (CFD) is used to calculate the cooling performance of plunger tips. Considerations are also made for the often-ignored Leidenfrost effect, as the phenomenon considerably affects plunger tip cooling performance: specifically when the water flow is low or thermal conductivity of the tip material is high. Although the cooling performance of the tips is very important, it is hardly the only factor: cost, thermal stability, scrap, wear, material strength, life span, and safety are necessary considerations when manufacturing a proper plunger tip for any application. Thermomechanical simulation is used to estimate stresses and deformations in the plunger tip, which can evaluate the plunger tip's thermal stability and life span. In regards to plunger tip material, some key factors are thermal conductivity and softening temperature. Although copper alloys deliver excellent thermal conductivity, they are not as strong as steel and have significantly lower softening temperatures.

MATERIAL SELECTION FOR DIECAST TOOLING: DECISION THEORY AND PRACTICE (Foundry Trade Journal)

Yahya Mahmoodkhani and Paul Robbins from Castool Tooling Systems

Abstract : A wide range of engineering materials is available to manufacture diecast tooling. However, only a handful of them get used due to many parameters. This paper outlines a decision theory for material selection that considers key parameters such as tooling life, cycle time and cost. It notes the main reasons for tooling failure, which are the harsh conditions of the diecast process, and how tooling life is improved by using proper materials and designs. Simulation is an effective tool to evaluate new materials and designs, and examples of practical simulation results are supplied to support the decision theory.



https://www.castool.com/knowledge-base/publications/

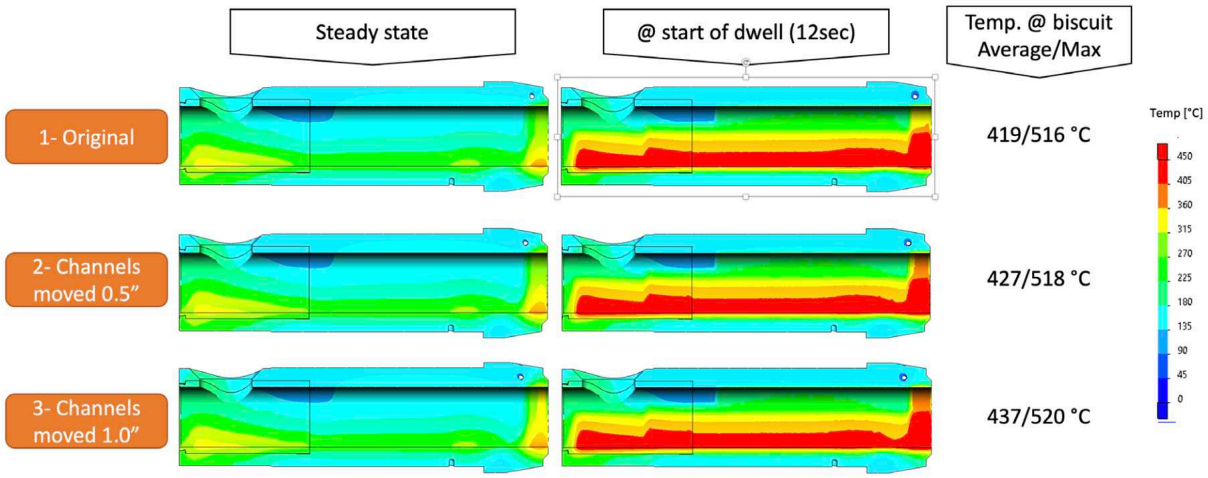
All thermally - controlled shot sleeves are leak - and pressure - tested during inspection. Many of the large shot sleeves have in excess of 100 plugs. Castool heats each shot sleeve to 300 F and allows it to cool, then hydraulically pushes oil through the sleeve, watching for leaks. This practice has proved very successful in preventing leaks during operation.

DIE CAST SIMULATION

SLEEVE : MOVING THE COOLING RING

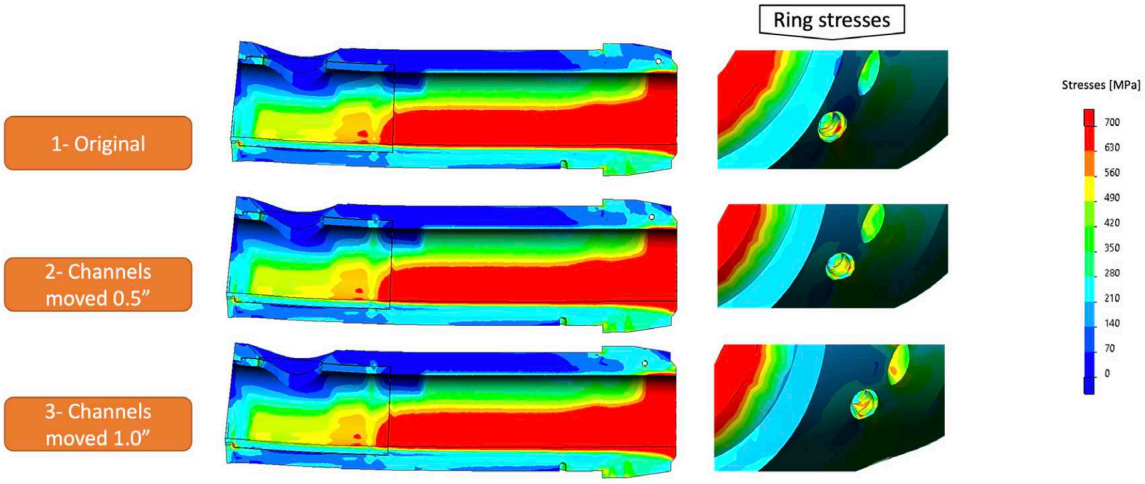
- *The customer was experiencing short sleeve life with the main failure mode being cracked at the die side and through the drilled cooling ring.*
- *Simulation analysis was performed to optimize the location of the cooling ring while providing sufficient cooling to biscuit.*

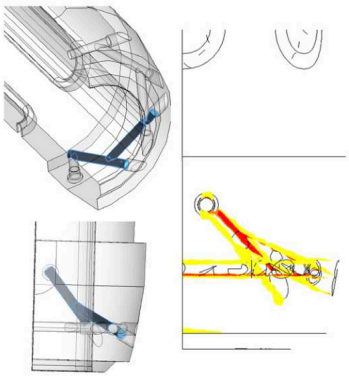
THERMAL ANALYSIS



STATIC ANALYSIS (at the start dwell-12 sec)

Deformation Scale: 30





- *Table shows stresses at the bottom of the cooling ring where the highest stresses are observed. The location of the measurement shown in the picture*

	Average [MPa]	Max [MPa]
1- Original	443	2285
2- Channels moved 0.5”	429	1366
3- Channels moved 1.0”	448	1538

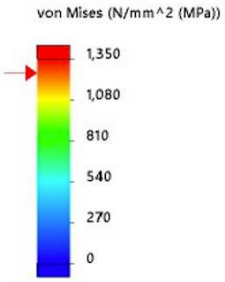
- *The comparison shows that moving the grooves 0.5” backward, will help reducing the stresses. However, it results in an increase in temperature of the biscuit area.*
- *The design #3 (1.0” moved grooves) results in higher stresses compared to the design #2 (0.5” moved grooves) with higher temperature at the biscuit area.*

EXTRUSION SIMULATION

DUMMY BLOCK FOR HIGH PRESSURE EXTRUSION

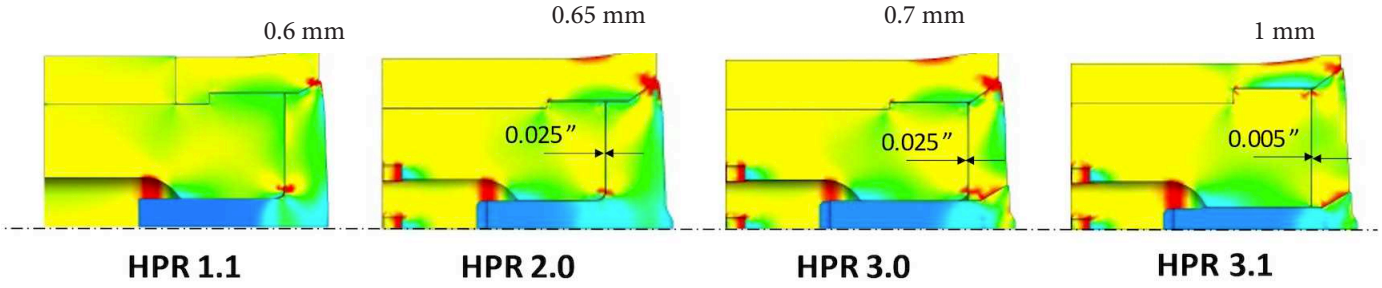
With increasing demand for extra high - strength profiles and using long billets to improve recovery, dummy-blocks are going under much higher pressures which jeopardizes the tooling life.
A comprehensive simulation study was performed to optimize High Pressure dummy block (HPR) design.

The 2.0 is the latest one-piece mandrel design with 0.025" gap,
The 3.1 is the thin ring design with 0.005" gap,

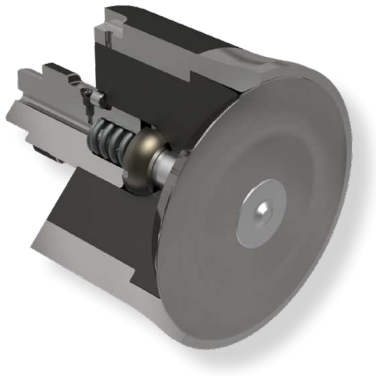


DUMMY BLOCK DESIGN OPTIMIZATION (face pressure = 117 ksi)

Ring expansion in diameter



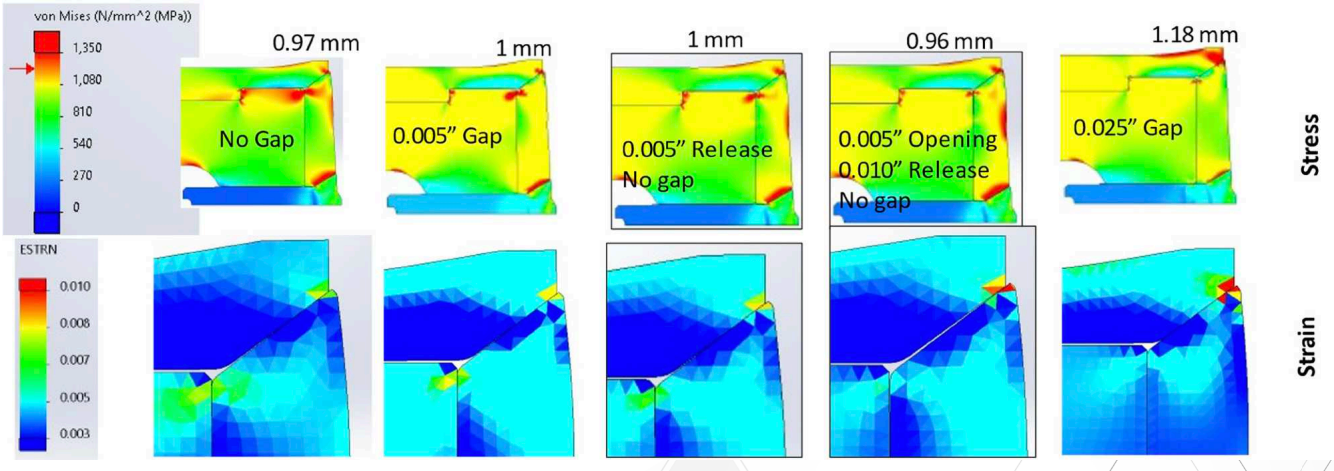
HPR 3.1



Castool is always searching for tooling that is easy to use, priced competitively, and lasts a long time. We have been challenged by many of the modern short stroke extrusion pressures that may have rapid acceleration, long billets and short dead cycle times. The cause of failure is typically plastic deformation and reduced life.

In the new design, the plastic deformation is minimized, while the ring expansion is improved. It is relatively easy to use and competitively priced.

Ring expansion in diameter



TRADE SHOW UPDATE

Trade shows have been a thing of the past since Covid started in the winter of 2020. Most shows were cancelled and those that took place were poorly-attended. ET, the largest extrusion trade show and congress, was postponed two times, and will now take place in May 2022.

We took a chance when planning NADCA in Indianapolis, hoping that it would be well-attended, with no guarantees. I am happy to report that the NADCA show held October 4-6, 2021 has been very well-attended and the quality of people attending was very good.

Our team spoke with most major die casters in North America, and machine builders from Europe and Asia.

It was the first show that we shared space with Exco Engineering. I believe this worked very well for our customers and companies. Castool with Exco Engineering's help, as well as our other partners Swiss Steel, InterGuss and Schmelzmetall, truly offer **BETTER CASTINGS FASTER.**

ET '20
50 YEARS

BOOTH#509

Come and see us in Orlando, Florida May 3-5. Castool will be presenting 3 papers and have our whole team present.

EUROGUSS

BOOTH #7A-712

Come and see us in Nuremberg, Germany June 8-10. We will have our whole team present, including Exco Additives.

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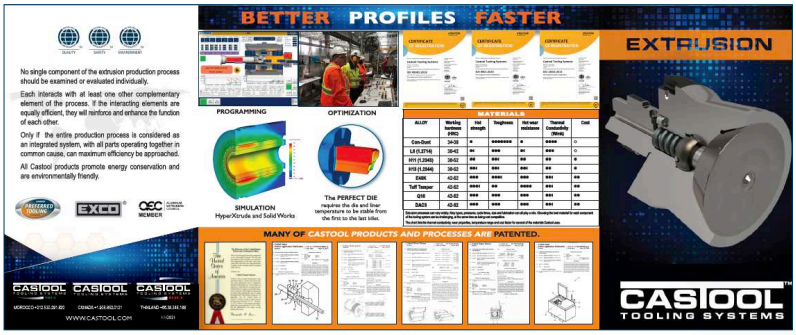

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CASTOOL™ TOOLING SYSTEMS

UPCOMING EVENTS

CASTOOL™ TOOLING SYSTEMS 180

DIE CASTING & EXTRUSION

BOOTH 509	3-5 MAY 2022	**TWELFTH INTERNATIONAL ALUMINUM EXTRUSION TECHNOLOGY SEMINAR & EXPOSITION** Orlando, USA	ET'2022 50 YEARS
	10 - 14 MAY 2022	**ALUMINIUM 2000 WORLD CONGRESS ICEB** Rome, ITALY	ALUMINIUM ICEB 2022
	9-11 JUNE 2022	**METEF THE INTERNATIONAL EXPO FOR THE ALUMINIUM** Bologna, ITALY	metef
	8-10 JUNE 2022	**EUROGUSS - INTERNATIONAL TRADE FAIR FOR DIE CASTING** Nuremberg, GERMANY	EUROGUSS — BOOTH 7A-712
BOOTH	27-29 SEPTEMBER 2022	**ALUMINIUM DUSSELDORF WORLD TRADE FAIR AND CONGRESS OF THE ALUMINIUM INDUSTRY** Dusseldorf, GERMANY	ALUMINIUM
BOOTH 316	13-16 SEPTEMBER 2022	**DIE CASTING CONGRESS & TABLETOP** Lexington, Kentucky USA	DIE CASTING CONGRESS &TABLETOP
BOOTH BA-40	16-19 NOVEMBER 2022	**METALEX THAILAND 2021** Bangkok International Trade & Exhibition Centre Bangkok, THAILAND	METALEX METAL WORKING INDUSTRIES MACHINES-TOOLS, INDUSTRIAL ENGINEERING,

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Keattikhun Chaichana	***Sales Manager Asia***
Glenn Titmuss	*Sales Coordinator APAC*
Andre Iulianetti	*Product Specialist North America*
Jean Dembowski	*Commercial Manager*
Tanmanun Tiantip	*Commercial Supervisor*
Christine Kaschuba	*Customer Service*
Sue Lotton	*Customer Service*
Sue Biliu Su	*Customer Service*
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Patcharee Parkong	*Siam Anglo Alloy Co.Ltd*
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