



Innovation; always.

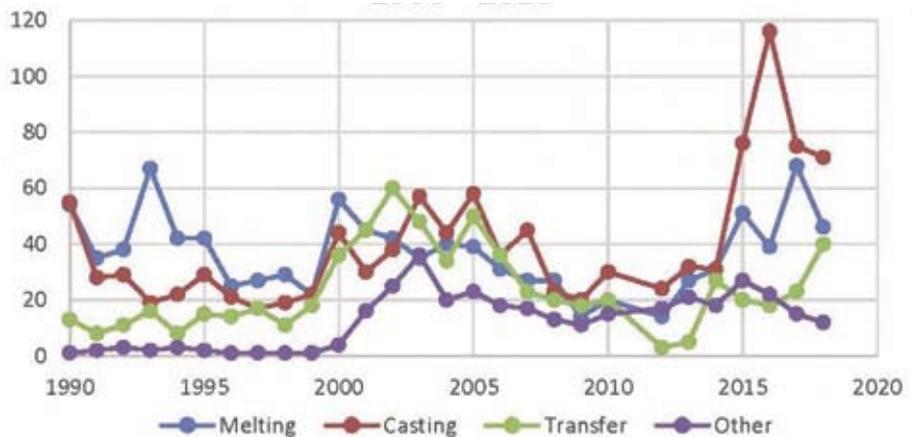
When safety and production rate work together

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Managing casthouse operation is not a simple task; many aspects must be taken into consideration. Nowadays, everyone wants optimized processes, increased safety and of course, greater production rate. What if you could safely charge 42 tonnes of aluminium into your furnace in less than 20 minutes, using a single machine, and while benefiting from complete versatility for other casthouse operations using that same machine?

It took a major accident in the USA back in September 1967 to trigger the awareness of the need to impose safety in the casthouse. Still today, the Aluminum Association monitors reports of molten metal explosions, which remain an industry preoccupation. Many actors cooperate in building a better understanding around molten metal explosions and how

Annual incidents by operation, 1990 to 2018



Source: The Aluminum Association, Annual Summary Report on Molten Metal Incidents in 2018

to mitigate the risks, but sadly these accidents still happen. In 2018, 170 explosion incidents

were reported (148 Force 1, 20 Force 2 and 2 Force 3) translating into 26 injuries, including eight fatalities [1]. Only four years ago, a major molten metal explosion in a Mexican aluminium smelter forced the evacuation of hundreds of people. Fortunately, though, no injuries were reported [2].

Over the years, many safety measures were put into place, starting with better fitting PPE, and with more accurate awareness of hazards that exist in a casthouse. However, a brief overview of the latest incidents reveal that we still need further improvements:

- While skimming impurities, an employee slipped on an oily work surface; pushing his hand and arm into the pot
- Undetermined contaminant created a flash fire in a furnace, causing serious burns
- Alloy addition into a melt pot provoked an explosion [3].

Mecfor's casthouse solution – applied technology to better service safety issues

Safety in casthouse operations has been a constant engagement of Mecfor's engineer-



Mecfor casthouse solution with QuicConnect charging and tending tools for various tasks

All photos: © Mecfor, unless otherwise noted

ing team. The company started implementing its solutions more than 20 years ago. At the time, it was somehow bold to think that one sturdy vehicle, coupled with dedicated tools, could perform all operations such as: furnace charging, skimming, tending plus dross bins and handling finished products.

However, this approach has proven its efficiency. It increases safety and optimizes the vehicle fleet, reducing the number of equipment items required. Mecfor's casthouse solution addresses two of the higher-risk factors in casthouse operations: it reduces co-activity of several operators, and their exposure time to molten metal, while making use of good practices with tools specifically designed for an operation.

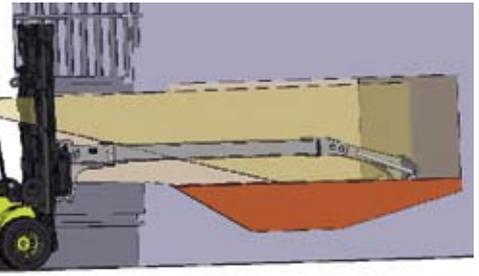
By giving the operator the mean to switch tools while remaining seated in the vehicle's cab, it much reduces the number of people / pedestrians in the casthouse surroundings. Thanks to its multifunctional concept it also decreases the number of equipment items needed to perform required tasks to ensure all casthouse operations. By working on these

parameters, casthouse risks can be much reduced.

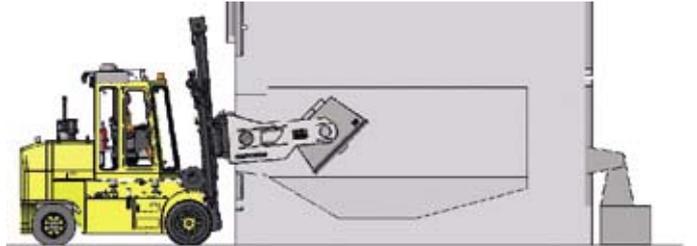
How does it work?

Mecfor has designed a built-to-last vehicle that is supremely versatile. By using its very efficient, hydraulically powered QuicKconnect system, the vehicle can be coupled easily to specially engineered tools, customized to perform specific operation. This approach has the benefit of shortening the operation time, reducing the associated energy loss, causing less refractory damage, and most of all, ensuring the safety of operators.

While remaining safely in his cab, the op-



Mast apron acting as a shield protection while operator's vision remains good above the tool



Loading with rotating bin that also offer protection against metal splashes

erator can switch from one tool to another in less than 15 seconds, using a push button to rigidly lock the tool onto the mast apron. The



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hydraulic powered QuickConnect system opens up a range of possibilities to develop tools to better fit today's casthouse realities and challenges. The operator can then do all the furnace tending / charging tasks using only one vehicle with an array of tools.

Design is a piece of art

When Mecfor team of experts starts elaborating a Casthouse Solution for a customer, special attention is paid to the design of the QuickConnect furnace charging and tending tools. There are three reasons for this:

- Optimizing the operator's vision of the work zone



Optional rotating seat



Triple protective glass assembly

- Ensuring the adequacy and success of the operation / task
- Reducing the risk of damaging the refractory.

Industrial forklift trucks offer a visible area under the tool when the mast apron is in a high position, thus exposing the machine directly to metal splashes. Mecfor's casthouse solution provides a view above the tool, with a position of the mast apron in a shield mode when working near molten metal. This way of doing things also greatly reduces the operator's risk of occupational back and neck injuries by promoting a relaxed and natural position of the operator during the task. If the operation requires it, a hydraulic lifting cab can be offered, as well as the installation of fixed, made to measure spacers under the cabin, so as to set the operator's vision in the right angle / axis for his safety and comfort.

In addition, the shape of each tool presented is designed to fit the shape of the interior of the furnaces, taking into account the level of metal present and the type of material to be loaded; this for a maximum risk control. The tool can be designed to suit round induction melting furnaces, allowing for horizontal or vertical charging.

Increased safety and productivity

Safety is not a luxury; it is a necessity in the workplace. No one will offer his best if he risks injury or death. At Mecfor, we bear this in mind, and offer an ergonomic work environment so that the operator can focus on the jobs that need to be done.

Indeed, the operator who works in a Mecfor casthouse solution mode, humps into a healthy and comfortable environment right from the beginning of his shift. The air quality of the cab is controlled by the air conditioning and heating unit including positive pressure and active filtration. His 360-degree vision is optimized by the generous windows. The rotating seat (available as an option) will let him drive while facing in direction he is going, also when moving bulky loads. A 360-degree camera system, along with proximity scanners, will help him to see a danger that would otherwise be out of his field of view. Improving his comfort will improve his level of concentration, thanks to pneumatic cab suspension, an ergonomic seat of superior quality, and equipment with electronic controls at the top of the technology.

In addition, the vehicle provides increased protection against explosion during loading and tending of furnaces: a triple protection glass assembly resists the impact of an explo-

sion, the heat of molten metal splash, and glass bursting. This advanced protection is at the top of Mecfor's range of built-in protection layers, such as the tempered glass offering scratch and heat-resistance, or the classic polycarbonate synthetic glasses that can easily be replaced.

Smelters that have been using Mecfor QuickConnect technology system have enjoyed a quick return on investment, while bringing their workers a safer work environment. Safety, productivity, maintenance of the equipment and ergonomics were the major factors considered in the design of this multi-functional vehicle with an automatic tool QuickConnect system.

Technology at your service

The Mecfor Smart Tool option allows limits to be set on the speed and power of the machine functions, according to the tool used. This helps to control the human factor, and limits the risks of incidents. Any travel speed may be interrelated to ensure a safe operation, depending on the realities of the casthouse. Customized programming offers flexibility and infinite possibilities of settings of the equipment. It can even force the operator to comply with the safety procedures in place, though without reducing the performance of the equipment.



Industrial forklift offering poor vision



Visibility, ergonomic and adequate protection

Source: www.hsssearch.co.uk/page_62872.asp

Real life application

Back in 2016, Eurofoil Smelter in Luxembourg started looking into how they could increase operators' safety during furnace loading operations. At the time, the plant was using industrial forklifts to perform this crucial task. They experienced recurrent metal splash because the forklift had to get too close to the furnace sill.



Metal splash on industrial forklift while loading ingot into furnace. The forklift gets too close to the furnace sill.

The client was searching for a vehicle with a lifting cab giving greater visibility during the operation. Also, the equipment needed to maintain the 2-metre distance requirement from the furnace sill, allowing a safe distance between the equipment and the melting furnace. Finally, the solution had to be compliant with *Inspection du travail des mines Luxembourgeois (ITM)*. Mecfor was able to meet



MVR22 with lifting cab

its client's needs with an ergonomic and safe equipment design with its casthouse solution customized to Eurofoil. The output and final results met all requirements. This had a significantly positive impact on production rate, thanks to the QuicKconnect technology.

Operational training: the efficient way to ensure best practices

An approved trainer seat is available in option for all Mecfor vehicles. This seemingly innocuous option does, however, make it possible to train and coach new employees. The first hours of operation are so striking, what better than an instructor or an experienced employee beside the trainee when he drives through the plant for the first time. At each commissioning of equipment, a training is given to operators by one of Mecfor's qualified technicians. This ensures good practice and gives the right understanding to everyone on how to work with a Mecfor Casthouse Vehicle.

Furthermore, the addition of an operator ID option helps to better supervise a junior operator by limiting his access to certain tools and/or reducing the speed of the machine in certain areas. This ensures that he will gradually get accustomed to the equipment, and minimizes the risk of accidents. The 360-camera recorder option and MecforLink telemetry system can follow step-by-step each unit and each operator in their operational habits.

These technological additions are very useful to develop risk prevention measures, because they offer a complete history of situations when an analysis is deemed necessary. MecforLink information (who does what, in what machine, with what tool, at what time of the day) can be combined with the ability to review a recorded video of an event, which makes easier to understand the circumstances. In terms of modern connectivity, the Mecfor safety package offers the ability to trace operation at a specific moment.

Conclusion

The new mindset is that 'safety and productivity are mutually inclusive a good safety culture will have a direct impact on the company's bottom-line' [4]. Mecfor has been implementing its casthouse solution concept for decades, bringing continuous improvements not only to the vehicles, but also to the tools and their mode of operation. Safer production can be achieved while using proper casthouse equipment with proper tool design.

References

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Author

Impregnated with the world of mechanics since his early age, René Laliberté, started his career in 1998 as a field service technician for mining, forestry, construction and road building heavy equipment. Over his many years having his hands on solving mechanical issues, four years were dedicated to technical product support, three as technical sales representative. Back in 2015, he started at Mecfor, an aluminium industry equipment designer and manufacturer, as an after-sale service technician; position that he had for two years. Since 2017, he covers the US territories spending time with his customers, exchanging know-how and knowledge. His close to end-user approach allows him to better understand their situation. His diverse background of various mobile equipment technology, moving different loads in various situations is bringing a refreshing view for operational analysis, continuous improvement and solution findings.