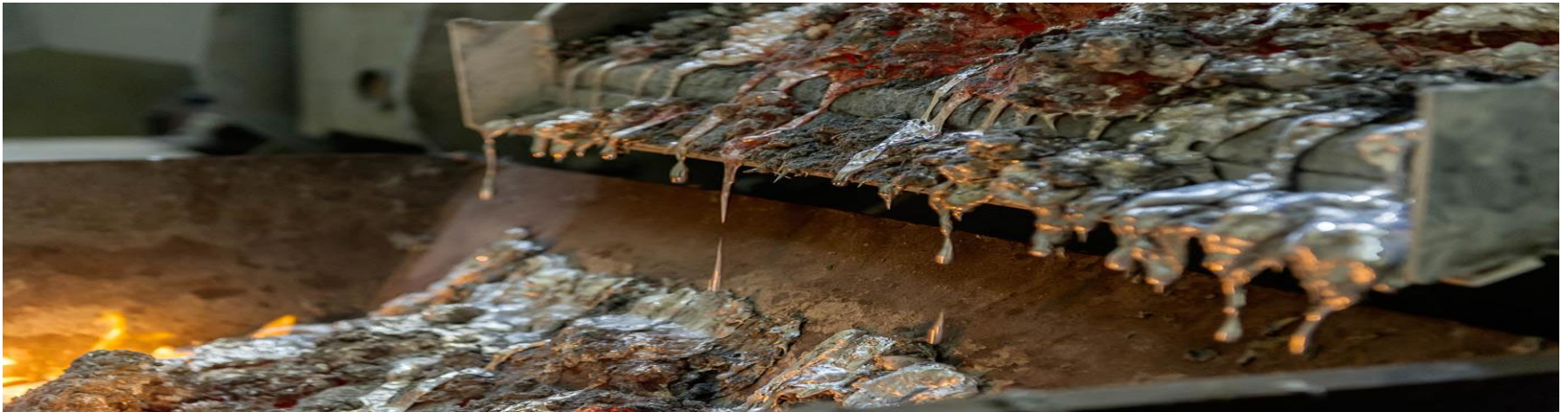


Johannes Messer – Consulting GmbH



Johannes Messer Consulting
The 4 challenges in aluminum HPDC“
Aluminum foundry industry is changing

Introduction

For several years, the aluminum foundry industry has undergone a major transformation worldwide.

The industry has come into the focus of financial and strategic investors.

The main reasons are:

- Strong growth in the industry (past and future)
- Substitution of products of other processes and materials (for example stamped, bent and thermoformed steel parts)
- Importance of the industry for the automotive sector (perceived supplier, know-how industry)
- Manageable purchase investments (mainly medium-sized companies)
- Below-average profit margins (... low purchase price with corresponding development potential)

As a result, major players have changed owners:

- Honsel
- JL French
- Teksid
- KSM
- etc.

Tier 1 companies such as ZF, Magna, Martinrea and others have thus found their way into the aluminum foundry market. New, partly large market participants (... so far mainly medium-sized companies) have emerged. This has led to a major change in the entire aluminum foundry market.

Introduction

Currently, far-reaching changes are to be expected again. The automotive industry, as the largest customer of the aluminum foundry industry, is facing a serious change. The demands for a drastic reduction of CO₂ emissions are getting stronger. Weight reduction and e-mobility are identified as major levers. As a result, today's article portfolio of the aluminum foundry industry will change "revolutionary". Hybridization as an expected "intermediate step" to e-mobility will once again place significantly higher demands on foundries in assemblies such as gearboxes, as in the case of current products. The ultimate impact on the foundry industry is not yet fully apparent.

First indications of the extent and significance of the expected changes are given by the automotive industry itself.

Only a few years ago, the automotive industry significantly reduced investment and thus capacity in the in-house aluminum foundries. Currently, the OEMs are investing again in their own foundries. Audi builds e.g. a new die casting foundry for aluminum structural parts.

All in all, the aluminum foundry industry faces significant challenges:

- Internationalization
- Product portfolio
- Technologies
- Employees

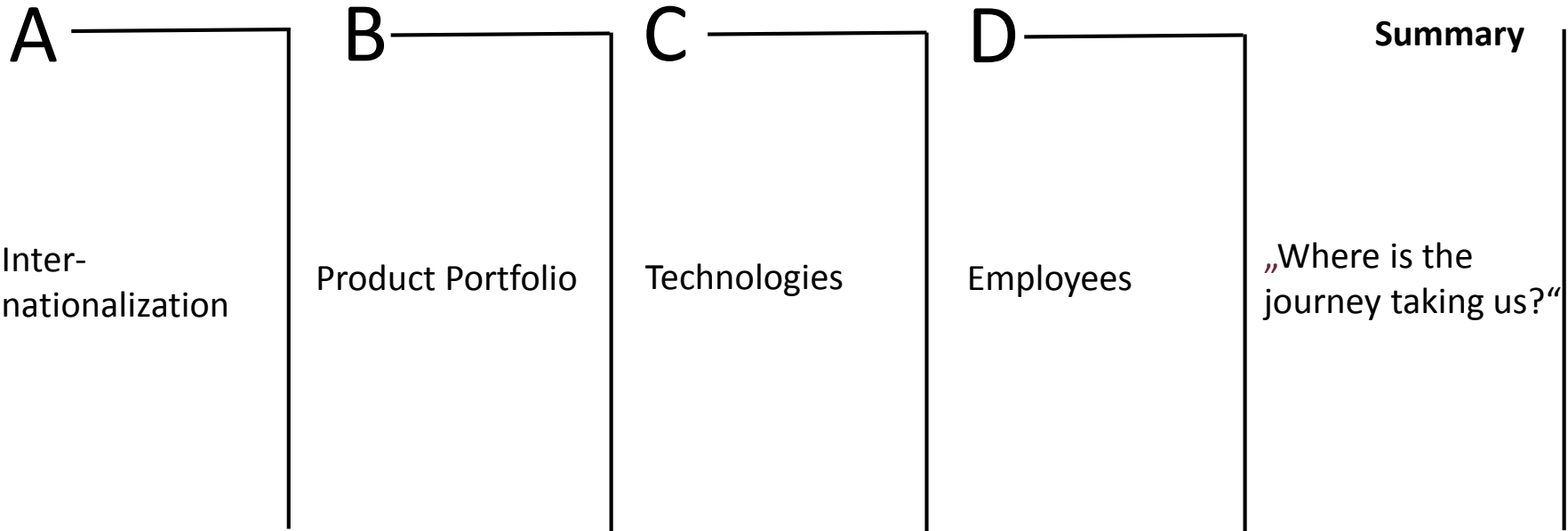
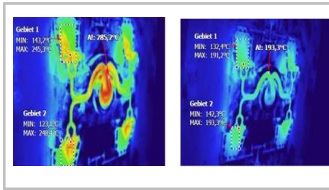
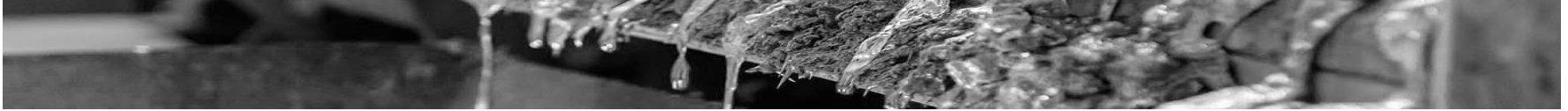
In the long term, only the foundries that have the short-term strategic answers to these significant challenges will be successful.

Estimates, expectations and recommendations on the following pages.

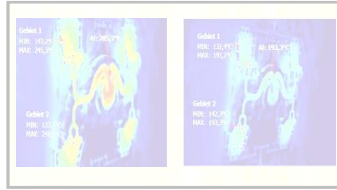
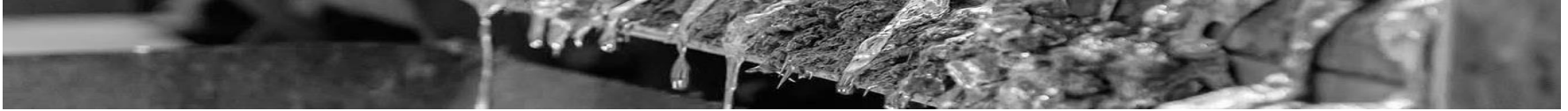
Glück Auf

Johannes Messer

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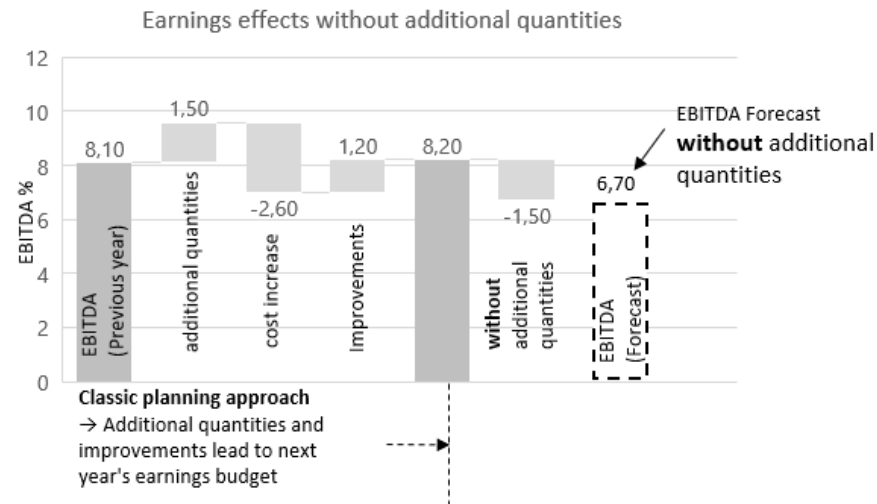
Summary

„Where is the journey taking us?“

Internationalization

The internationalization of the automotive industry has gained considerable speed in recent years. The global growth regions are now occupied by all OEMs. OEMs strategies (platform strategy, common parts strategy) means that identical components are needed at different locations around the world.

Current sales forecasts for the automotive industry show that the growth of the next few years will take place outside the existing growth regions. The requirements e.g. in Europe, according to current forecast, will stagnate in the next few years. If short-term declines in demand occur in the context of a stagnating economy (risk in Europe in 2019/2020), this can lead to serious result problems, especially for foundries.



In order to capitalize on global growth and offset fluctuations in individual regions, OEM-oriented foundries need appropriate long-term strategies.

Internationalization

The big market participants

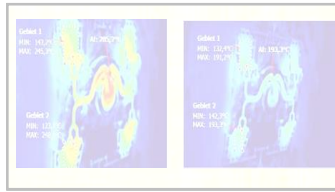
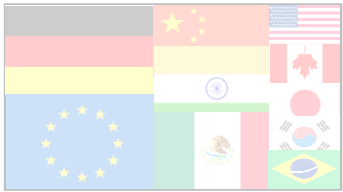
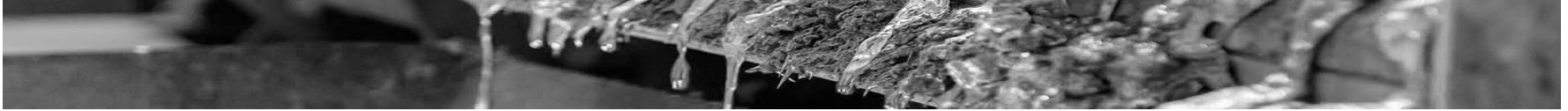
Company	Home Country	Japan	USA Canada	Mexico	South America	China	India	Europe
Ahresty Corporation	Japan	✓	✓	✓		✓	✓	
Hiroshima Aluminium Industry Co., Ltd.	Japan	✓		✓		✓		
Georg Fischer	Switzerland		✓ (JV Linemar)			✓		✓ CH & 5 others
Group Bocar	Mexico		2018 Alabama	✓				
KSM (CITIC DICASTAL)	Germany		✓			✓		✓ Germany & CZ
Magna International (COSMA)	Canada		✓			✓		✓ HU & 2 others
Martinrea Honsel	Canada			✓	✓	✓		✓ Germany & ES
NEMAK 1)	Mexico		✓	✓	✓	✓	✓	✓ 8 countries
Ryobi Limited	Japan	✓	✓	✓		✓		✓ UK

1) Largest market participant in the aluminum foundry market

- The big foundries are growing and investing in internationalization
- The growth regions of China, India and Mexico are rapidly gaining in importance
- JV and partnerships with competitors, customers and suppliers are becoming increasingly important
- Tier 1 suppliers buy or invest in aluminum foundries (ZF, Magna, Linemar, Martinrea, ...) and are strong new competitors

The OEM-oriented foundries must position themselves internationally in the short term

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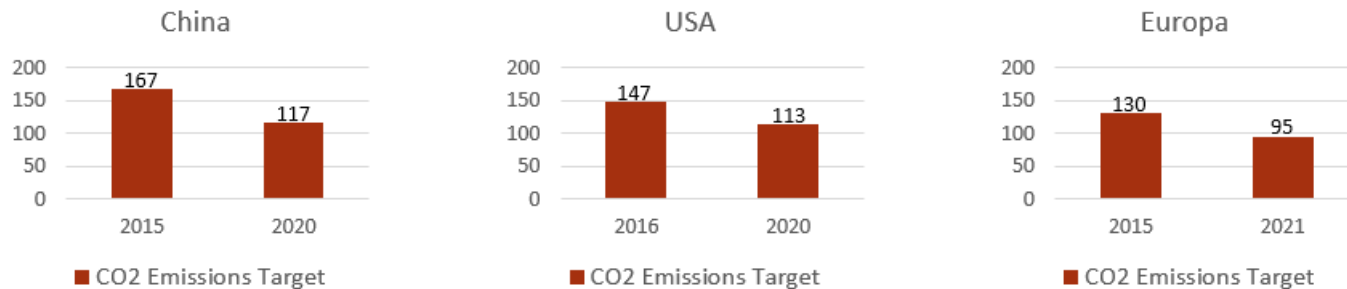
Summary

„Where is the journey taking us?“

Product Portfolio

For the past 50 years, the growth of the aluminum foundry industry has been characterized by the substitution of different engine and gearbox components with aluminum castings. Automobile engine blocks and truck gearboxes were the last significant parts from the early 1980s, which led to significant market growth in the field of aluminum casting. Meanwhile, this substitution is completed in principle. In addition to Europe, all other regions worldwide have now followed suit. In the engine and transmission sector, no increases in the aluminum casting requirement due to substitution are expected.

With global demands to drastically reduce CO₂ emissions:



CO₂ Emissions Targets for new cars (CO₂ g/km)

is the automotive industry as one of the major CO₂ polluters under heavy pressure. E-mobility and weight reduction are currently the levers with the greatest potential for CO₂ reduction.

As a result of this development, the aluminum foundry industry will experience the biggest change in the product portfolio of the past 100 years. The previous "bread and butter" parts, engine and transmission will disappear in the long term (Intermediate step hybrid). New parts in the powertrain will be created. Together with the growth market of chassis and structural parts, there is the potential to generate growth in the area of aluminum casting in the next few years, despite this dramatic change. Demand forecasts predict this.

Product Portfolio

Growth market: chassis and structural parts

→ New Products



→ Bigger locking forces

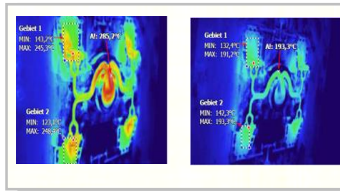
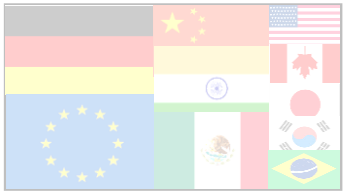
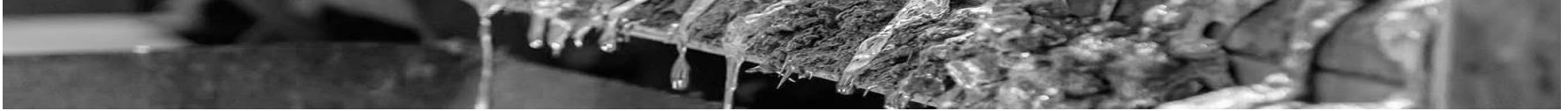
- Italpresse Gauss (IT): bis **5600 to**
- Idra (IT): bis **5500 to**
- LK (CN): bis **4500 to**
- Bühler (CH): bis **4400 to**
- Frech (DE): bis **4400 to**
- Maicopresse (IT): bis **4200 to**
- Toshiba (JP): bis **4000 to**
- OMS (IT): bis **3500 to**
- UBE (JP): bis **3500 to**
- Colosio (IT): bis **3200 to**
- Zitai (TW): bis **3000 to**

- High investment in "large" die casting machines (growth market)
- High costs for new product launches and process developments
- Result "losses" (cash flow) due to declining volumes of the current series parts (engine and transmission)
- Strong competition due to overcapacities in the locking force ranges 1800 to - 2500 to (previously high proportion of engine and transmission parts)
- Large demand in the short term for employees with foundry know-how
- Need for cost optimization

Source: CAEF – High Pressure Meeting Nürnberg 2018

The changes in the product portfolio offer opportunities and risks. Only foundries with appropriate technology, financial strength, employees and ultimately strategy are able to seize the opportunities.

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Technologies

Due to the serious changes in the area of the product portfolio, as well as the increased pressure of cost optimization, technological developments are absolutely necessary.

Short-term fields of action arise with the topics:

- Salt cores
- Vacuum die casting
- Minimal lubrication
- Heat treatment
- Alloy development
- (Additive Manufacturing Process: Currently only interesting for prototype development)

The requirements that define this for the foundries are enormous. In terms of time, the situation gives no room to move. At the same time, new products must be designed and industrialized at short notice, as well as new processes developed or at least further developed.

A high demand for foundry expertise resources and financial resources is needed in the short term and is also needed in the medium term.

Technologies

Salt core technology

The salt core technology has been around for a long time. The right breakthrough, however, has so far failed. For a long time, the closed-deck cylinder crankcases were considered a promising future application. However, e-mobility will limit the costly development of this application.

The use in the growing market of chassis and structural parts is conceivable. However, **current technology advancement** for these parts **is unlikely at this time** due to other key issues.

Vacuum die casting

- For crash-relevant structural components essential (constant quality)
- Requirement for the necessary heat treatment of the structural components
- Improved mold filling for thin-walled components
-

Minimal lubrication

- Reduction of water consumption (... also wastewater)
- Significant reduction in cycle times
- Increasing the mold life
- Better process reliability / quality → high importance for chassis and structural parts
-

Technologies

SSM castings

With the further increase in component requirements (mechanical properties, weight, wall thickness), thixocasting and rheocasting have become significantly more important. Worldwide, work is being carried out on various developments, especially in rheocasting. The main goals of further development are above all cost and process optimization. In the long run, SSM casting will play a significant role in highly stressed parts.

Heat treatment

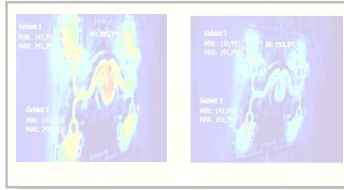
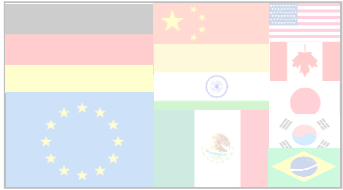
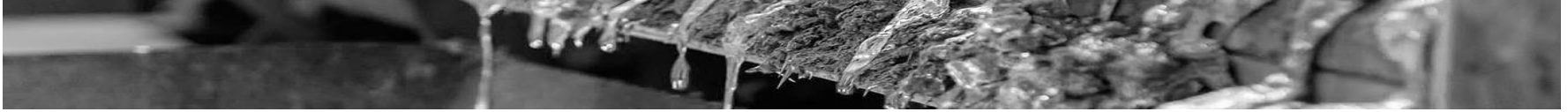
Crash-relevant components of the vehicle body with strains of > 10% must be heat-treated. The aim of the heat treatment is to adjust the tensile strength and elongation to the required part requirements. On the one hand, the heat treatment increases the foundries value chain, on the other hand, the **technology** (for example warpage of the castings) **should not be underestimated**.

Alloy development

Alloy development is one of the key challenges in the development of chassis and structural parts for the casting process. The components have high requirements for **elongation at break, yield strength and tensile stress**. The casting process requires a **basic castability** (long flow paths), **long die life** and a **calculable shrinkage** after demoulding the castings. The cast parts must be **heat treatable** (T6, T7) and may **distort as little as possible** there. In the final assembly, the parts are then often **glued** or **welded**.

The technology fields have top priority in the short term. Only foundries with expertise in these issues will benefit from the booming market of changing product portfolios. In the medium term, productivity improvements with these technologies are of existential importance.

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Employees

Technical process and product innovations come at shorter intervals. Internationalization is advancing with great strides. Businesses are changing, e.g. through acquisitions, from one day to the next. The employee is much more in focus than before.

There are currently two main fields of activity for the foundry industry:

- Recruit qualified employees and retain them in the long term
- Gain managers with leadership skills to handle today's challenges

The task of employee recruiting has also gained importance in the foundries in recent years. In the past, people applied to the companies, today the companies apply to the employees. In order to retain the employees in the long term, profound changes in the overall working environment and corporate culture are necessary. Creative work tasks, flexible working time management, education and training, health management and appreciation are just some of the topics that have gained new meaning.

In order to successfully implement all the current challenges (internationalization, product portfolio, technologies, employees), the key to success lies in visionary leaders with leadership qualities.

It is often assumed that management is always leadership. This is a mistake. Managers are those executives in the company who have the ability to guide people through established values, beliefs and existing knowledge, following solid processes and rules. However, in the upcoming challenges, the foundries at the top need leaders who are also able to give people a vision and guidance, and to win them over.

Employees

"Total Quality Management is important, but Total Management Quality is ten times more important"

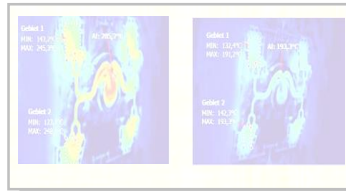
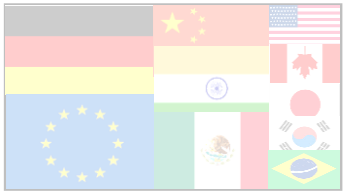
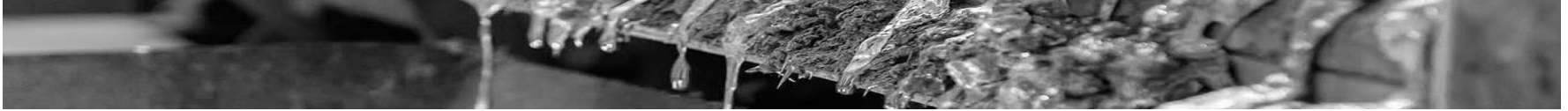
Prof. Dr. F.Malik

The focus of continuous improvement in recent years has been very strongly oriented towards classic quality management topics. Quality and process improvements were achieved through this approach in the enterprise. The cost structure has been improved.

Given the complexity of the current challenges, this approach is no longer sufficient. It will depend critically on the quality of the management, whether the challenges can be overcome and the opportunities offered can be used.

In the long term, only those foundries will succeed that will be headed by people who, with passion, enthusiasm and conviction, will carry their visions and strategies into the company and their employees. Employees must become Follower of the Leaders.

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Internationalization



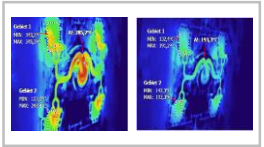
The OEM-oriented foundries must position themselves internationally in the short term.

Product Portfolio



The changes in the product portfolio offer opportunities and risks. Only foundries with appropriate technology, financial strength, employees and ultimately strategy are able to seize the opportunities.

Technologies



The technology fields have top priority in the short term. Only foundries with expertise in these issues will benefit from the booming market of changing product portfolios. In the medium term, productivity improvements with these technologies are of existential importance.

Employees



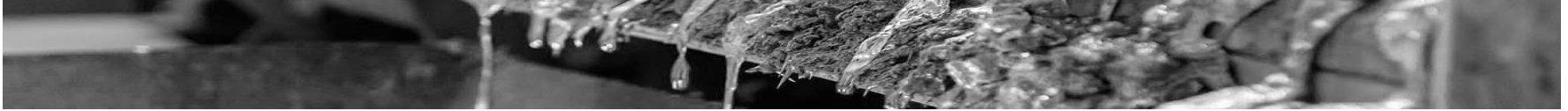
In the long term, only those foundries will succeed that will be headed by people who, with passion, enthusiasm and conviction, will carry their visions and strategies into the company and their employees. Employees must become Follower of the Leaders.

„Where is the journey taking us?“



The currently emerging change in the aluminum foundry industry is far more serious in its effects than anything we have known in recent years. Companies that are unable to cope with the challenges have no market authorization in the medium term (short term?).

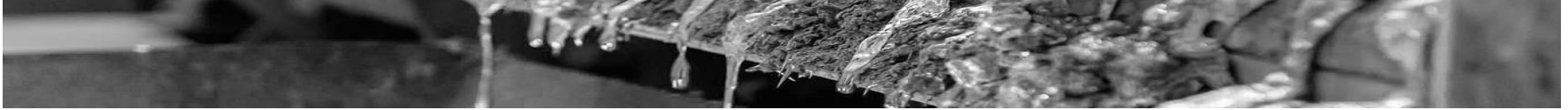
To do's



Foundries now have to adapt their business model to the new situation

- The strategy needs to be revised
- The technology roadmap has to be focused
- The corporate culture must be geared to the new requirements
- The cost base is urgently to be optimized
- Partnerships must be closed
- Financing must be secured in the long term (financing roadmap)
- The management quality has the highest priority

... we help you with the answers, and with the implementation.



"It's not said that it gets better when things get different.
But if it should get better, it must be different "

Georg Christoph Lichtenberg



STRATEGY DEVELOPMENT



MANAGEMENT CONSULTING
INTERIM MANAGEMENT



NETWORKING



COMPANY ANALYSIS