

Preview of K 2022: *Kunststoffe* Questionnaire on the Situation in Injection Molding Machine Construction

Harsh Realities

The plastics world stands transfixed by its high mass in October: the K 2022 in Düsseldorf, Germany. The masters of ceremony of European injection molding machine manufacturing traditionally have a presence here, with a particularly high rate of innovation. Time to take stock: in what condition and with what agenda is the industry presenting itself after two-and-a-half years of a difficult climate? We have conducted a survey: insights into the dominant themes of the age.

There's no getting around K 2022. All the participants in the current *Kunststoffe* questionnaire are agreed (see Box p. 23). However, this only represents the exhibitors' points of view. First, the companies are under no illusions that the trade show might take place unaffected by the Covid pandemic. "That is a utopian vision for me. We have had to deal with harsh realities for two years, and a reinvigoration of the pandemic in October is unfortunately very realistic," said Gerd Liebig, CEO of Sumitomo (SHI) Demag. Michael Wittmann, Managing Partner of the Wittmann Group added: "The Corona virus will not do us this favor. However, as things stand at present, we can't foresee how K 2022 will take place as regards hygiene and safety

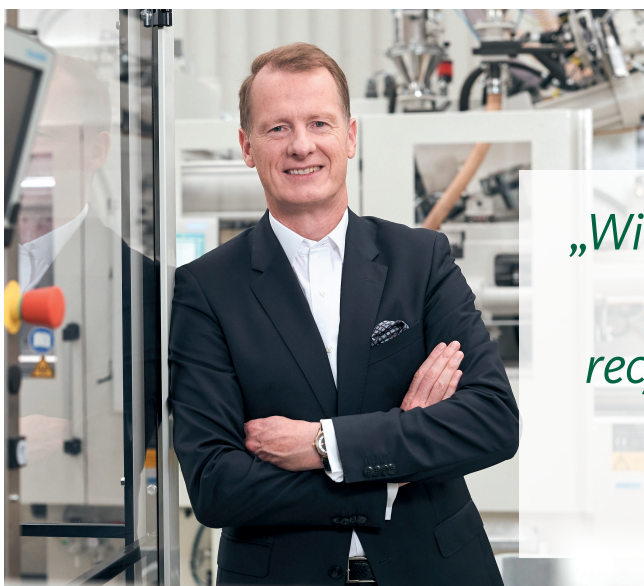
measures. Fakuma 2021 showed impressively that a trade show can offer visitors and exhibitors added value even in times of pandemic and that no video conference in the world is a replacement for a personal visit and first-hand experiencing of machines and equipment." Klaus Geimer, Deputy Managing Director of Dr. Boy, added: "If global visitor numbers only decline slightly compared to K 2019, and we have such a positive discussion and investment climate as at Fakuma 2021, we can be more than satisfied."

How Much Is the Covid Pandemic Influencing the Trade Show Planning?

It seems that the companies have factored reduced visitor numbers into their

trade show planning. "I'm assuming that fewer visitors will come, especially from Asia, than we have been used to in the past. However, the number of visitors has no influence on our trade show planning," explained Dr. Michael Ruf, CEO of KraussMaffei. Gerhard Böhm, Managing Director for Sales and Service at Arburg, backs this up: "Our trade show planning will not be affected by this, quite the opposite. Our presence at K 2022 will be bigger than ever." And Michael Wittmann, too, is making an announcement: "The Wittmann Group will be represented at K 2022 with the biggest booths ever. However, we are calculating in house that the number of visitors will only be about 70 percent of the K 2019 level."

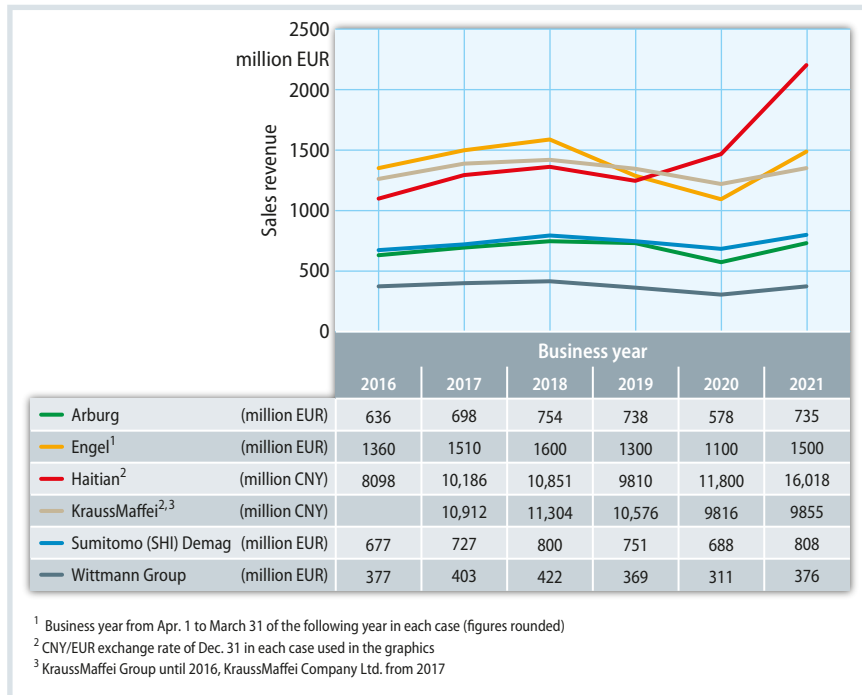
Dr. Gerhard Dimmler, CTO of the Engel Group assessed the situation similarly: "It is likely that fewer customers will be able to travel from China to Düsseldorf. But we are planning for the K show to take place as we know it, and we look forward to many discussions »



Dr. Michael Ruf, CEO of KraussMaffei. © KraussMaffei

„With our solutions, over a million metric tons of high-quality recycle can already be brought back into circulation.“

Dr. Michael Ruf



Sales by injection molding machine manufacturers in the years 2016 to 2021. However, the figures are not comparable for the reasons mentioned in the text.

Compilation: C. Doriát; source: companies; graphic: © Hanser

with international trade show visitors." Gerd Liebig, too, expects that Chinese and intercontinental visitors will stay away because of the pandemic. "However, this will not affect our trade show planning; after all, the plastics world is looking for answers that will result from changing market conditions – the key words here are: sustainability, recycling and multi sourcing."

What Marks Has the Corona Virus Left on Companies?

The pandemic has definitively also left marks on companies, not only on workflows. As a new dimension of the work routine, concern about employees' health is explicitly mentioned. Michael Ruf described the situation in early 2020 as follows: "Like many other companies,

we at KraussMaffei also had to play it by ear from the first day of the first lockdown. We intensified communication, developed hygiene concepts, initiated home office solutions, acquired masks and self tests and distributed them to our staff, and later conducted multi-stage vaccination campaigns. With this crisis management, we managed to maintain our production and continue to supply our customers."

All the participating companies set up home-office working – in the departments where this was possible. However, the actual effectiveness of this measure can only be assessed after a long phase in a "post-Corona work environment," summarized Michael Wittmann.

But many companies have made a virtue out of necessity and also gained positive insights from this crisis. Less surprisingly, there is one area, in particular, that is affected by this: "Digitalization has progressed faster than would probably be the case without the pandemic, particularly in communication. Virtual discussions and even virtual machine acceptance tests have become a matter of course. Demand for online support and remote maintenance has risen, since our customers have recognized that they can use them to safeguard their productivity and delivery capability even in the

event of future crises," said Gerhard Dimmler. "What we have also learned in the last two years is how important personal contacts are and will remain. The digital possibilities open up big opportunities for more efficiency as well as higher productivity and competitiveness, not as a replacement for but as a complement to the traditional forms of cooperation."

Gerhard Böhm is in agreement – and sees this confirmed elsewhere. "It is correct that digitalization cannot replace personal contact one-to-one. Our maxim has always been only to use digital tools and formats where they offer genuine added value. But the years marked by the Covid pandemic have confirmed once again that our strategy of manufacturing at a centralized site is absolutely correct." Klaus Geimer covers a wider scope: In 2019 the industry emerged from an "age hostile to plastics" and in 2020 slid into a completely unpredictable pandemic, characterized internally by staggered working hours for different teams and externally by a significant decline in investment. "From fall 2020, it all turned into an unexpected long-term boom, that is still going on," said Geimer. But the crisis mode remains: "We have a situation in which we are having to deal with material scarcities, galloping prices and a deficit of technical staff."

Michael Wittmann added: "Actually, the economic marks left by the pandemic were manageable until the end of last year. The indirect consequences of the pandemic have only emerged this year. The massive disruptions in supply chains and logistics are causing delays in production, and consequently lower sales revenue."

One Machine Every Nine-and-a-Half Minutes

The companies' revenue charts show a V-shaped curve in most cases, even though differently shaped (see Graphic). Up to a certain degree, this reflects the importance of the automotive business for individual manufacturers. However, it cannot be seen as more than a trend, since the figures are hardly comparable. Thus, the sales of the Wittmann Group also include a large proportion of the robotics and ancillaries equipment business, and at Arburg, a small portion of

Info

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„In this situation, we must deal with material scarcities, galloping prices and the shortage of skilled personnel.“

Klaus Geimer



Klaus Geimer, Deputy Managing Director and Head of Administration at Dr. Boy. © Dr. Boy

the “additive manufacturing” segment. And since its IPO on the Shanghai Stock Exchange, KraussMaffei Company Ltd. has been a conglomerate, consisting of the KraussMaffei Group (incl. Netstal), the TianHua Chemistry Machinery and Automation Research Institute Co., Ltd. and Fujian Tianhua Intelligent Equipment Co., Ltd. The KraussMaffei Group in turn, which earns around 80% of the revenue of the stock market-listed holding, earns its cash not only with injection molding machines (approximately half), but also with extrusion and reaction technology.

The undisputed industry leader according to sales and volume is the Chinese injection molding machine manufacturer Haitian, which withdrew its agreement to take part in this questionnaire at short notice. Unlike its competitors, Haitian’s recovery set in earlier and with more verve. In the past business year, sales by the Group were EUR 2.2 billion, corresponding to a rise of almost 36% compared to the previous year. In this period, only Engel achieved such a leap, though they had lost ground a year earlier. Another surprising fact: according to its own information, Haitian sold over 56,000 injection molding machines in 2021 (over 10,000 abroad for the first time), corresponding to one machine every nine-and-a-half minutes – a historic record for the entire industry.

Are There Differences in the Main Themes for the Trade Show Presence?

A finding from recent years is also that the plastics industry – not just mechanical engineering – is increasing coming under pressure to justify itself. Good balance sheet figures are no longer enough; society demands answers to

urgent problems. The focuses of the organizer and ideational sponsor of the trade show, and the exhibitors are therefore set correspondingly.

According to Michael Wittmann, “The focuses of our product presentations go hand in hand with the trade show themes of sustainability, digitalization and the circular economy. We have a modern and very energy-efficient product portfolio and want to present the advantages for the user even better. As a striking representation of energy saving potentials, our machines, and for the most part the ancillary equipment and robots, too, are connected to our Imagoxt measurement system. This provides unfiltered consumption data, detailed information on energy distribution and long-term trends.” In addition, new functions of the HiQ Flow and HiQ Melt assistance systems will be presented, which make an important contribution to the circular economy. From the field of digitalization and future operating systems, the HoloVoice system, a combination of voice and gesture control, as well as production-related “Mixed Reality” applications will be presented.

At Engel, the topics are slightly varied. “Energy efficiency has shifted back into our customers’ focus again, and much more strongly, due to the steep rise in energy and material prices. Demand for all-electric machines is rising. Those who think they are already taking advantage of the full energy saving potential will be surprised at the Engel booth. With a smart cooling solution in combination with digital products, far more becomes

possible,” said Gerhard Dimmler. Digitalization is a pioneer for both higher energy efficiency and greater sustainability. With intelligent assistance systems permitting uniformly high product quality, even with fluctuations in the raw material, recycle can also be used for high-quality products. This would be a prerequisite for closing material loops.

Dr. Boy intends to demonstrate the complex of digitalization and automation by connecting the machine, handling and ancillary equipment to a host computer. For climate protection, the small machine manufacturer refers to the compactness and the small carbon footprint of its injection molding machines. According to Boy, the energy consumption can be displayed and optimized for each partial cycle step. This is supported by a new screen page for a digital water-flow meter. Klaus Geimer added a special aspect: “For environmental protection, we place most importance on avoiding or reducing production wastes. For this, we are showing our small-machine concept, where the nozzle is in direct contact with the part to be molded without a sprue being produced. Alternatively, we offer sprueless nozzles across the entire delivery program.” For processing recycle, they are presenting an example of the reuse of fishing nets from marine litter.

Arburg is not only dedicating itself to the themes of digitalization and resource conservation on its own booth, explained Gerhard Böhm. “We will also present our “arburgGreenworld” in the VDMA Circular Economy Forum – in a »



very unusual manner." Gerd Liebig is somewhat more concrete: "Our visitors can look forward to a large number of innovations about the above-mentioned topics. Thus, we are showing a world innovation in the field of all-electric machines, a fully automated and highly efficient production cell for medical parts, but also individual solutions for automation and digital process monitoring – to name just a few highlights."

Michael Ruf, on the other hand, is more reserved: "Our main topics are sustainability, digitalization and new technologies. However, we won't reveal

must not be minimized. Ultimately, the circular economy contributes to combating the energy crisis. The aim of treating plastic wastes is to consume less energy than is necessary for manufacturing virgin material." Reducing the carbon footprint is not a purely technical challenge; rather, it requires close cooperation along the value chain. "This is a matter of information transparency, circulation of information, so to speak.

manufacturers not only offer the necessary hardware but also a wide portfolio of digital solutions. KraussMaffei makes the same point: "In the past three decades, over a million metric tons of high-quality recyclate have been brought back into circulation thanks to our solutions," said Michael Ruf. "An example of this: global demand for disposable articles, mainly in the health care sector, is huge, and the products are often only used briefly and

„Recycling is a matter of information transparency, the circulation of information, so to speak.“

Dr. Gerhard Dimmler



Dr. Gerhard Dimmler, CTO of the Engel Group. © Engel

how we address and present them until K. Otherwise it wouldn't be a surprise." Although one surprise has already been leaked: KraussMaffei will present a coup on additive manufacturing, and thereby open up a new business field.

How Are We Progressing with the Circular Economy?

Since the topic of the circular economy first came to the fore at K 2019, the political and social pressures to achieve higher recycling quotas have increased. Current events such as the war in Ukraine and the forerunners of the climate crisis are also contributing to a different assessment of how to manage limited resources, and our dependency on them. Many companies are working on solutions to close previous gaps in the sought-after circular economy, and limit the consumption of virgin material.

Gerhard Dimmler sees a risk here: "In view of current challenges, these topics

The R-Cycle initiative, which Engel joined in spring 2022, pursues precisely this goal. With digital product passports, R-Cycle creates the basis for a high-quality recycling process by automatically gathering recycling-relevant information during product manufacturing. It is important for us to include consumers from the start in the cycle of information. A great deal of clarification is necessary here, particularly with the topic of packaging," said Dimmler.

For Gerhard Böhm, there is an important point here: "We machine makers are not the problem, we are a part of the solution as we show the technical possibilities and the resulting business models. Our activities concerning 'arburg-Greenworld' include both the stable processing of recyclates and solutions for reliably identifying, sorting and recycling post-consumer plastic products, and returning them to the material cycle."

To use plastic wastes more intensively in the material cycle, the machine

not very contaminated. Ideal prerequisites therefore for using them afterwards as raw materials for parts with a longer lifetime. At K 2022, we are presenting technical solutions for this cycle."

How Do We Overcome Economic Limits?

Besides the technical side, there is also a political aspect to this issue. "We reach a limit where the outlay for recycling is more expensive than the manufacture of virgin material. From my point of view this will not be possible without state intervention in the cost structures," said Klaus Geimer. And Gerhard Dimmler notes: "Technologically, there are no limits to the material cycle. However, it is important that each individual step be economical within the process as a whole. Otherwise the process chain cannot function unbroken. Without economy, there is no ecology."



Michael Wittmann, Managing Partner of the Wittmann Group. © Wittmann

„The injection molding process cannot make high-quality parts out of inferior recyclate.“

Michael Wittmann

“In principle, the processor needs financial incentives to switchover to such materials. The difficulty is, for recycled, as well as compostable, parts, to obtain a part quality comparable to that of virgin material. Everyone involved in the process chain must meet this challenge and solve it jointly,” Gerd Liebig explained, and continued: “As far as we are concerned, we continuously improve our machine control systems and are currently working on a new digital platform that will create data transparency and form the basis for new solutions. This will be presented in more detail at K.”

Virgin Material Only to Compensate for Shrinkage and Increased Demand

Only the circular economy permits long-term economic growth together with minimization of resource consumption, stresses Michael Wittmann. “That is es-

pecially important for Europe, where the extraction of raw materials is limited or encounters societal resistance. Materials must be recirculated as often as possible to limit the use of new raw materials to the inevitable depletion and increased demands. We recognized the importance of this theme at an early stage – for example all our products support the processing, conveying, drying and dosing of regrind.”

As a special variant, Wittmann offers the Ingrinder. This is the compact integration of a G-Max blade granulator or an S-Max screenless granulator into the injection molding machine. Sprues are immediately reground and fed back to the process. With the controlled feed of regrind to virgin material, the Gravimax gravimetric metering unit is also used. “Regrind places particular demands on

conveying equipment, since it often contains more dust, which must be removed appropriately. Our Feedmax centralized conveyors will be extended at K with a corresponding model with high dust-removal performance,” said Wittmann.

Which Concrete (Digital) Solutions Are Ready for the Market?

There are numerous approaches for reducing the consumption of virgin material. “It begins with the product design and the choice of an efficient manufacturing process. It is then a matter of achieving acceptable parts as fast as possible during production, and keeping rejects as low as possible. In this context, I would like to highlight the assistants of our Gestica control system, which can be used, e.g., to reduce the setting times and optimize the cycle sequence, as well as optimize the energy efficiency,” sums up Gerhard Böhm. »

„The requirements for the respective product must not be over-fulfilled, since that is usually to the detriment of recycling.“

Gerhard Böhm



Gerhard Böhm, Managing Director for Sales and Service at Arburg. © Arburg



„In principle, the processor needs financial incentives for switchover to recyclates.“

Gerd Liebig



Gerd Liebig, CEO of Sumitomo (SHI) Demag. © Sumitomo (SHI) Demag

Manufacturing injection molded parts from recyclates is challenging because of the growing bandwidth of the materials and their batches, their different origins and treatment as well as their processing behavior. However, this is not a problem for an appropriately equipped machine – Arburg offers a recyclate package with special software and hardware features for this purpose.

Other manufacturers, for example Engel, KraussMaffei and Wittmann, have comparable solutions in their program – like Arburg not only since yesterday, but the desired plastics cycle gives them a new importance. Since, in order to really close the material loops, according to Gerhard Dimmler, “we must end the currently practiced downcycling and achieve a genuine recycling or upcycling.” This includes, in conjunction with a plasticizing system adapted to the particular material, intelligent assistance systems, be they called iQ weight control, APC plus or HiQ Flow, which identify viscosity fluctuations in the raw material and automatically compensate it in the same cycle.

With one restriction: “Even if the assistance system were able to compensate for very large fluctuations in the quality of the recyclate, it will still be in the interest of the processor, to leave the adjustments of the control parameters within a defined range for critical injection molded parts. It will never be possible to take recyclate that

is largely of inferior quality and use it to manufacture mechanical load-bearing parts,” is how Michael Wittmann puts it in a nutshell. “Too much, or inferior, recyclate should be qualified as reject by limiting the control parameters, even if it can be compensated via the process technology.”

Raw Materials Sources and Design Guidelines

Which brings us to the raw materials source. Setting up a value creation chain for the circular economy with uniform feedstock quality would be to the benefit of everyone involved, stresses Michael Ruf. He refers to a flagship project of efficient recycling that is currently being created in the USA: “The recycling company has a regular supply of large quantities of carpet waste from PP composite material. These high-quality traceable wastes are the backbone of a recycling value chain, which is more effective and more profitable than processing of virgin materials.”

Another example: PET has so far been the only packaging plastic that, as a recycled material, can be processed back into food packaging on an industrial scale. At K, Engel, is presenting the first manufacture of thin-walled containers from rPET on an injection molding machine. Gerhard Dimmler: “That is a world’s first. Only the newly developed high-performance injection unit of the

e-speed machine allows PET to be processed by thin-wall injection molding in only one step.” Beyond the bottle-to-bottle cycle, it is now conceivable to establish a bottle-to-cup or even cup-to-bottle recycling. This shows that, besides digitalization, machine and technology innovations continue to play a big role.

Advances in this area are particularly important, since “Packaging and short-lived consumer goods now have the biggest and fastest material loop. A rapid effect can be achieved here, since the products are quickly available again after a short use phase. A key demand lies in the sorting of the material streams – there are a large number of initiatives underway to improve sortability using new identification methods,” said Gerd Liebig.

The automotive and electronics industries, for example, have entirely different prerequisites. In this case, it is a matter of developing and implementing new design guidelines that would simplify separation of the materials at the end of the product’s life cycle. According to Liebig, “The life cycles of these products are significantly longer, to that the material loop needs to be longer in order to gain momentum – the requirements are, in addition, far greater, since the recyclates must also have a high long-term stability.” Gerhard Böhm agrees, “It is important not to over-fulfill the requirements for the respective product in the

selection of plastic and the part design, since that is usually to the detriment of recycling."

In principle, the industry faces the technical challenge of making recycle also fit for high-quality parts. "The quality standards for food-grade packaging applications and the adequate and constant sourcing of recyclates from qualified sources remains a critical parameter for the present," said Michael Wittmann. To use lower-purity recyclates, points out Michael Ruf, it is at least still possible to embed them completely in virgin material using a process technology such as coinjection.

And KraussMaffei is already in the happy position of being able to cover a wide range of this growth market. Extrusion technology, the biggest field after injection molding, already deals with the process steps plasticizing and degassing, as well as regranulation and recompounding. "The biggest advantages offered by KraussMaffei are the different plant concepts for thermomechanical, solvent-based or chemical recycling. Depending on the requirement, we can execute them as stand-alone or cascade solutions," according to Ruf. "Another benefit is the system solution comprising single- and twin-screw extruder especially for solvent-based plastics recycling. KraussMaffei is the only manufacturer in the world to offer this combination as a one-stop solution.

Reason for Optimism?

The participants in the questionnaire are chiefly characterized by a mood of optimism. "Despite the many imponderables, incoming orders have stayed at a consistently high level. This confirms the fact that plastics are simply irreplaceable," said Klaus Geimer, summarizing his

outlook. All the survey respondents can look forward to a high level of incoming orders at least until mid-year. "There is a clear willingness to invest – that is shown by numerous large new projects that we have launched in past months or have already implemented. In addition, our customers are also vigorously manufacturing with their existing machine park," confirmed Gerhard Böhm. Gerhard Liebig is also optimistic, "We are well prepared and will continue to grow vigorously thanks to the increased interest in sustainable solutions. After all, we were the first in Europe to have developed a complete site in Wiehe from hydraulic to all-electric."

Expression of their own strength and optimism: investments by injection molding machine manufacturers remain at a high level. A representative comment by Michael Wittmann: "We have made high investments in buildings and new machines in order to expand production and make it more efficient. We are currently building structural extensions at our production sites in Austria, Hungary and the USA. The biggest project is currently that from KraussMaffei: "We will begin relocating to Hannover and Parsdorf near Munich in summer and late fall. The two new factories are a big step into the future for KraussMaffei – indeed the chance of a century, according to Michael Ruf.

In addition, the companies are united by two factors: the recognition of how important training of their own employees is in order to combat the shortage of skilled workers, and the experience that necessity has brought the industry and its suppliers and customers closer together. Lived solidarity and strong loyalty – a conciliatory conclusion after the hiatuses of the last years. ■

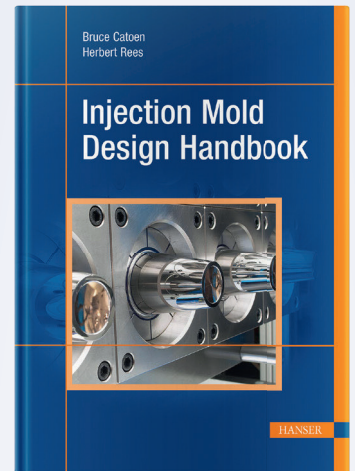
Dr. Clemens Doriat, editor

Participants in the Questionnaire

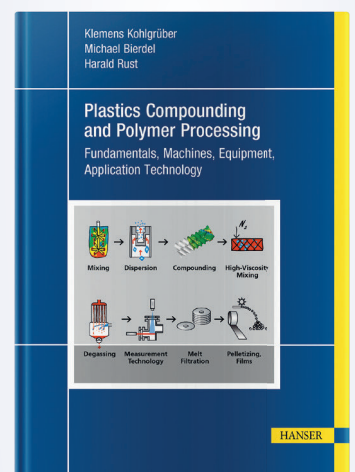
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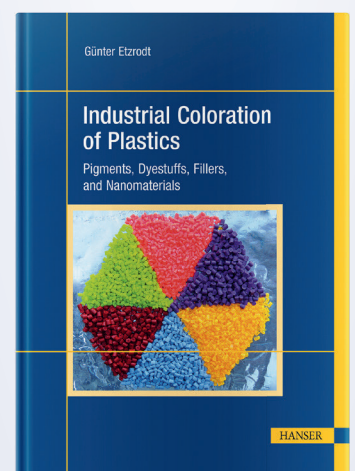
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