

There is a school of thought in the plastics industry that moulding is magic and only the 'old timers' can do it. If that was the case then Torsten Kruse, owner of Kruse Analysis, would be running Hogwarts where Harry Potter learned his craft, but he could not disagree more with this view.

"Injection moulding is a process, a very complex process but one that can be virtually simulated. Injection moulding simulation is a state-of-the-art tool to take the magic out of a complex manufacturing process," says Kruse, who was recently awarded the title of 'Expert' at a Sigma simulation conference in the US.

Well positioned to train future Harry Potters in the art of mould and part improvement, Kruse believes that companies need to use all the available tools at their disposal in order to be competitive, or their competitors will.

"Communication is critical. Understanding the part, how the mould is produced and the process in which the end product will be manufactured is the basis of my analysis, thus producing perfect simulation and suggestions to improve part and mould design," adds Kruse, whose work is based on Sigmasoft simulation software developed by Germany's Sigma Engineering.

School of wizardry

Having studied plastics technology in Germany, Kruse worked for injection moulding machinery manufacturer Arburg as a moulding expert, where he processed hundreds of moulds using materials ranging from plastics, thermosets, liquid silicon rubber and elastomers, to metal injection moulding, inserts and over-moulding. The role of his department was to assist the company's moulding machine customers with expertise to improve moulding processes and quality on their projects.

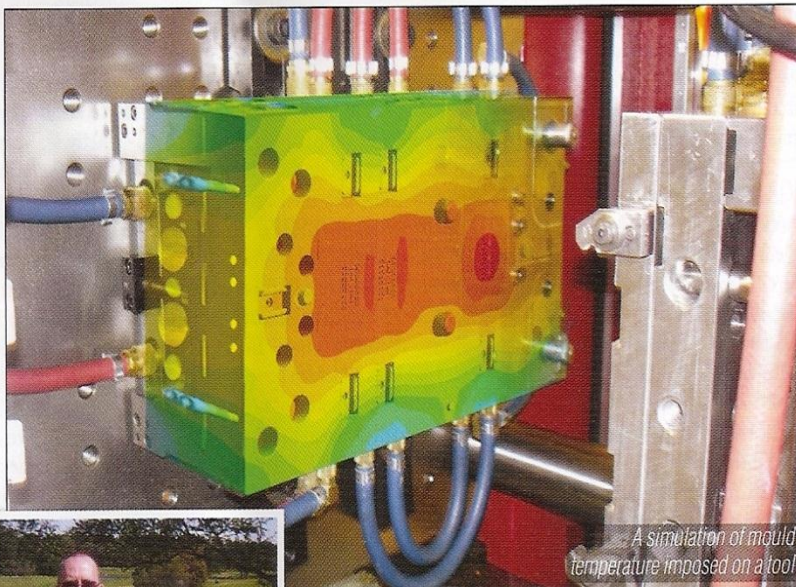
After moving to Arburg's US facility where he travelled the country working with injection-moulding companies on moulding challenges, it became evident to Kruse that most of the challenges were due to the lack of up-front detailed engineering, with too many compromises being made to get the part to market.

"I started to use simulation technology to virtually design and make visual potential part design and mould design issues," explains Kruse. "This was in 1994 and a year later I opened Kruse Analysis, with the objective of working with interested companies to improve their design strategies and thus the quality of their moulds and subsequent part quality."

"It all starts at the beginning, and if you do not implement good strategies early on, you will carry the challenges through to the delivery of the first

Pole position

What a racing car simulator is to Formula One fans, a computer-aided engineering simulation is to a moulding expert. **Steven Pacitti** talks to a man who has made the latter his work and his hobby



A simulation of mould temperature imposed on a tool



Torsten Kruse (centre) is keen to share his expertise with moulders

article to your customer."

Kruse's work starts with detailed discussions about the

client's project, focusing on initial part design, gating options, mould design strategies, production expectations, materials and the moulding process. Based on that initial discussion, Kruse will outline a strategy to get started.

"Based on the outline I will quote the project and then start to analyse the initial part design. As soon as I have first results, my client and I will review them online and formulate a strategy going forward to the next step in part or mould design."

Sigmasoft and the chamber of secrets

Computer-aided engineering (CAE) simulation has been around since the mid-to-late 1970s and even then, the early software packages showed great advancements in being able to predict simple flow behaviours. In those days that was all anybody could expect from simulation software.

"However, since then the expectations on this CAE technology from engineers has risen dramatically but the incorporation of details into new simulations has not necessarily kept pace," admits Kruse.

The reason for this, he says, is that because the process is so complex and companies are under such time pressure, details are often overlooked. Because of this, simulation results can be inaccurate and engineers lose trust in CAE and avoid it for future projects.

"A burned hand will avoid the candle," he adds. "The best method is to start implementing CAE simulations at the beginning of the part design cycle to avoid pitfalls. I have been able to convince non-believers to use CAE simulation having discussed all the details of their project."

In Kruse's opinion, the plastics industry depends a lot on manpower expertise but that expertise is only as good as the next project, and simulations are also required for each unique challenge.

"CAE simulations are there to aid the expertise of individual engineers, and I am using this software to virtually explain and show the entire moulding process. New CAE technologies can show the moulding process in true 3D reality and if such a tool is available then it should be

used in modern industries to improve time to market."

Simulation software in general is developed to virtually describe a process, which in the case of a complex process such as injection moulding, requires powerful computers. The objective is to have a virtual moulding machine in the form of a computer and software.

"We as people use the car to get from point A to point B quickly. However, we could walk the same distance but it would take us longer and perhaps provide more obstacles to overcome."

Sigmasoft, according to Kruse, is the only software currently available that gets close to the goal.

"Currently, I can take a CAD mould assembly into my system and simulate its behaviour in a multi-cycle simulation. This will allow me to actually run the CAD mould design as a virtual moulding machine.

"I can perform a 20-100 cycle virtual moulding trial and identify the true 3D mould temperature behaviour, which means I can more accurately predict the true fill, packing, stress, shrinkage and warpage behaviour of moulded parts."

Sigmasoft and the packaging hellos

With a diverse cliental from medical to automotive as well as packaging, the moulding expert's knowledge of the market segment is crucial to the success of simulation software.

"Anybody can buy this software and get trained on it, but it is important that the user is a moulding expert. It's not good enough any more to be an expert in jockeying software. Only an expert in all aspects can truly use the capabilities of the software," explains Kruse.

A simulation expert should know part design, mould design, the injection moulding process, how moulding machines work, and the nature of plastics and their behaviour. Only then can they call themselves an expert, just as Kruse has recently been certified by Sigma Plastic Services.

"My goal is to be available for my clients with expertise to help them avoid pitfalls and thus save time and money. I am willing to work with potential clients on a test project to show them the accuracy of simulations, the cost of which varies greatly depending on what is involved and expected from the client."

Despite being under strict confidentiality not to disclose details of any specific projects, Kruse says that he has worked extensively for the packaging industry assisting in thin-wall moulded part improvements.

"In general, packaging is a high-volume business and in such a business you need to be able to mould your parts as fast as possible to save cycle time and this production cost. Thin-wall packaging parts are especially a challenge and need detailed up-front simulation work.

"For example, if I can improve a moulding process by 1-2 seconds on a thin-wall part with a

cycle time of 10 seconds, that is probably 10-20 per cent faster cycles and a definite improvement in the cost base of moulding the parts."

Kruse goes on to say that any bad experiences that companies have had using simulation software are due to the system not being fed all the details required.

"These experiences can range from predicting injection pressure incorrectly to calculating part shrinkages and warpage wrong. Compromising all the system details during set-up will lead to failure and bad results."

So the message is simple. Simulation software

exists to enable moulders to virtually mould all parts in a true 3D environment under true moulding conditions, which enables them to make changes to the design before building an expensive mould.

And as the first industry 'expert' in injection moulding simulation, Kruse is in pole position when it comes to turning his hobby into financial savings for his clients. Albus Dumbledore would be so proud.

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