Male 1: Good afternoon, and thank you all for joining us. Today's webinar, Scientific Molding for Management... Principles, Benefits, and Implementation Strategies for Scientific Molding at Your Facility is brought to you today by Routsis Training and sponsored by Dyna-Purge. Your presenter today is Andy Routsis. Andy's the founder and president of Routsis Training, the premier training provider for the plastics industry. Over the last 30 years, more than 3,000 companies and 200 educational institutions worldwide have benefitted from Routsis Training by lowering scrap rates, reducing mold damage, decreasing machine setup time, and developing workplace skills.

Andy Routsis is also a hands-on engineer that administers advanced training for industry personnel on both part and mold design, as well as scientific and decoupled molding. Andy and his staff work with companies all over the world to develop the most effective online, hands-on, and ongoing training systems available. Now I'd like to turn the presentation over to Andy. Andy?

Andy: Today's webinar is focused on scientific molding for management. In this presentation, we'll discuss principles, benefits, and strategy for successful implementation of scientific molding at your facility. Everyone will be muted during this presentation, so I encourage you to type your questions using the webinar dialog box on your screen, and we'll answer all your questions at the very end of this discussion. At this time, I'd personally like to thank Dyna-Purge for sponsoring this webinar. Their wide range of products will help reduce your changeover times and scrap generation. I know from experience their products are easy to use and price competitive. And lastly, I encourage you to contact Dyna-Purge and get their expertise on the correct selection and usage of purging compounds for your needs. They have years of experience and will ensure that you get the best results.

We'll start with a few slides about our company, Routsis training and myself. Having been in the plastics industry for many years, I'm very familiar with the difficulty most companies encounter in finding, developing, and keeping their technical help. As a trainer, hands-on plastics engineer, and instructor, I fully understand the complications that are involved in conveying technical, abstract concepts. It's very challenging to get someone new to our industry to grasp complex topics such as sheer thinning and melt pressure. For nearly 35 years, our primary focus has been training and skills development for production employees in plastics manufacturing.

Years ago, Routsis began using some of the best technology available to create animations and simulations for VHS video tapes. Obviously advanced occurred, and we were the first to create computer-based interactive training using CD-ROMs. Now we provide high-quality online training courses using high-quality digital video and animation. We have a unique program called RightStart that blends online training, skill development exercise, and focused, hands-on mentoring. We actually come to your plant and develop a structured in-house training system that's custom tailored to your specific facility. And we offer on-site face to face training called SmartTech. This program revolutionizes technical training by combining online training with practical hands-on instruction to facilitate practical skills development. SmartTech is the most effective way to teach technicians and engineers applicable, scientific molding skills.

With an ever expanding global market, plastics professionals, schools, companies, institutions, and corporations around the world are developing and maintaining their plastics workforce with Routsis Training. Before we begin, I'd like to mention the freebies that are available to you as a participant of this webinar. You will receive a digital copy of our comprehensive guide for scientific molders. This guide provides information materials, molds, as well as step by step instructions on how to develop a scientific injection molding process. You'll also get a copy of our powerful processing spreadsheet, which is extremely popular with processing engineers and process techs.

Although these guides are available for download, you can also call and request an eight-pack of these market guides. These are free to you if you're located in the United States. The best quirk, of course, is to our four popular scientific molding courses, establishing a scientific molding process, as well as three skill set courses. Just send us a list of your employees that you wish to train, and we'll need their first name, last name, and email, and we'll be happy to set you up with online access. By the way, you can access all of our online courses on your smartphone, iPad, or internet, and begin training anytime. I just ask that you wait until after the presentation is done before giving me a call.

Excellent. I see that a couple questions have already been posted. Keep them coming. This will be a fast-paced presentation which will start by demystifying this scientific molding thing. Contrary to popular belief, scientific molding does not fix everything, but it's critical in identifying what works well, what needs fixing, and what needs to be done. If your employees are not using scientific methods to build, document, setup, and troubleshoot your processes, it'll be very difficult to compete in today's global market. Briefly we will explain how to troubleshoot in a professional manner which can be easily done by all of your technicians, as well as further the role of your employees in implementing scientific molding.

The truth is you need talented technicians with real scientific molding skills to reach the next level of competitiveness and profitability. The ways we typically try to apply Band-Aids to solve this talent program will be discussed, as well as proving sustainable methods of developing technical talent. We'll then cover all aspects critical to implementing scientific molding using your techs as well as some successful technician training models. Then we'll finish with a quick review, as well as an engaging Q&A session.

Science is about knowledge and understanding. As with all true sciences, injection molding is a science, and the injection molding process can be approached in a systematic and logical way. There are many helpful buzzwords in the industry, such as temperature, pressure, flow, and cooling of a plastic material. For example, some say you never really know what's happening to your part without pressure sensors inside your mold to determine the actual plastic pressure. Likewise, some machine OEMs will insist that you need to inject using parameters such as cubic centimeters or inches per second. With all the new technology, there are now dozens of way to measure the mold, material, and cooling temperature. Without knowing how to read, interpret, and use the data, it becomes information overload to many technicians.

For example, the documented first stage short shot weight is extremely helpful data reference point for troubleshooting, but this is not very helpful to a technician who does not know why you need a short shot, if the runners are included, how to make a short shot on that machine, how to properly use a scale, which scale to use, and where the scale is located. The fact is, a scientific molder needs the knowledge first so they understand what is supposed to happen with the process. Only then a tech can make an educated decision using real data to determine what is different and what parameter needs to be changed. The scientific molder then uses information and knowledge to gain an understanding to decide how to take effective and appropriate action. A scientific molder knows that without data you only have an opinion.

On the old traditional molding machines, the best way to process was to use a high-volume pump to fill the mold under volume. The low-volume pump was then used pressure to compensate for shrinkage, you hold the material in the mold under pressure. When block speed controlled machines came about, it was found that the best way to process was to use a short shot to determine how much the mold was filled, and then finish off with pressure to pack the part, thus the term "short shot molding" became popular in the '80s.

The big controversy was should we transfer from first to second stage on time, pressure, or position? As the machine control got better and more reliable, this separation of velocity-controlled filling and pressure-controlled packing was easier to control. More importantly, we are not relying on limit switches to transfer from first to second stage, as proximity switches could accurately signal a machine to transfer. Eventually the term short shot molding gave way to the term DECOUPLED molding in the '80s. This term emphasized the importance of separating first-stage filling from second-stage packing.

Now that there are easy to use, scientifically proven methods to develop, document, and troubleshoot and injection molding process, now any of your technicians can learn how to systematically determine the correct procedure to set basic parameters, such as first stage transfer position, second stage packing pressure, as well as perform more advanced tasks, such as optimizing the rear barrel temperature using a recovery time study. Whatever the term we use in our industry comes next will likely expand on the principles of scientific molding since scientific molding is always advancing to integrate the latest advancements in processing and technology.

Let's assume that you're the best trained scientific molder in the world, and taken every seminar and achieved every certification. Keep this fact in mind, processing is not the fix for everything. Even the best molder cannot consistently make a quality part if it has a horrible part design. Likewise, a tool with poor vents, gate, draft, cooling, etc, is unlikely to provide a robust and reliable process. Often the optimal process is difficult to achieve if the designer specifies the wrong material or the wrong grade material. Many general purpose machines are inadequate for a particular grade of material or achieving the optimum cycle time.

Lastly, your process may be affected for other reasons, such as poorly designed or inadequate downstream equipment. After the steel is cut and the mold is in the machine, how do you know if the issue is the mold, material, machine, part, or the equipment? Scientific molding provides methods and techniques to determine much of this information and data necessary to suggest what improvements are needed. In many injection molding operations, we'll typically have a key guide that's used to set up and develop a good process that will make an acceptable part.

This is how the typical setup sheet is developed. A scientific molder must first know the principles of what a good molding process really is, and follow systematic steps necessary to achieve it. For some low-volume molders, this may involve building a reliable process which meets specifications with a large process window. For most high-volume molders, this will involve a comprehensive process of drawing every fraction of a second that can be safely extracted from the cycle time while developing a stable process.

Once the molder has a plan, he or she begins a series of tests and studies to gather information and develop a data set of specific process outputs which make a good part. In this example, or as this process develops, the molder knows that shear thinning occurs at fill times of 0.9 seconds and below, while the optimal shot weight should be between 175 and 185 grams. Scientific molding provides a solid framework to help determine what the optimal parameters should be. This allows the process to run optimally using the available machine, mold, and material. More importantly, the process is built so the process is centered and can produce quality part as the material slightly varies. All this data is brought together to build the best process possible given the existing machine, mold, material, etc.

The same information is critical in determining whether or not more modifications can help improve the process. For example, more venting might allow a cycle time reduction of 0.2 seconds, and adjustment to the cavity, such as adding more draft angle, may drop cooling by 2 whole seconds. And a machine with a faster clamp could save 1.2 seconds. This is real process data which can then be used for a true cost benefit analysis.

The process inputs are helpful for die setters, but the most important data involves the process outputs, and only some of this data is found on your machine. A scientific molder knows that process outputs are far more important than inputs. Some of this data is obtained through measurements. The fact is every molder needs to know the process, not the parameters, which made you a good part.

One of the most frustrating things to a technician is getting a good part one day and not being able to get a good part the next. Possibly the second most frustrating thing to a technician is people changing their process without indicating when, why, or what they did. The more process data you have, the more you can improve, evaluate, or reference in the future. If you document the process when it's making good parts, then you have a basis for comparison when bad parts are being made. Good scientific troubleshooting is not about being the fastest at pushing buttons, it's about finding the root cause of a problem.

The key to finding the root cause is finding out what has changed. For example, if you're producing short shots and the transfer position is much higher, you need to locate the reason for the higher pressure. As you bring the process back to the standard, you'll either go back to making good parts, or you'll get a clear direction on what went wrong. For example, the cause in the change of injection pressure at transfer could be a blockage in the nozzle, or a block drop in the hot runner system. [inaudible 00:15:30] warpage could be caused by hot plastic, or perhaps a faulty mold temperature controller.

The most important part of scientific molding is that you're employees all use the same approach to injection molding. A well-developed and document process is helpful to everyone on the production floor, from die setter to process engineer. Proper documentation also becomes a foundation for establishing consistent process starter procedures, up to first piece approval. This will ensure that a process can be started up in the shortest amount of time.

Troubleshooting also becomes easier for everyone there when they have documented standards that they can attempt to duplicate. For example, your company should use the same combination of visual inspection, cavity balance, and material rheology to determine the best fill time for each new mold they qualify, or process they develop. Proper setting of the maximum injection pressure and injection time settings will ensure the machine never hits the mold with too much pressure or too much material if a cavity were to become blocked or damaged.

If there's a system in place to determine and document the appropriate short shot weight, it makes it easy for anyone to replicate the first stage injection transfer. Even if a tech has never qualified a tool and if they understand the basic process they can duplicate first stage injection on any machine just using a scale. In fact, two of the best parameters to check when troubleshooting is the first stage's short shot weight, and first stage injection time. When the fill time is significantly different, it can cause voids, sinks, shorts, flash, poor rejection, robot issues, parts sticking, flow lines, dieseling, warpage, as well as changes in dimensions, gloss, surface finish, and part weight.

Molders will always have to contend with material variation because it occurs when the plastics are made, but this is just the beginning since machine performance may drift over time, and tooling wear occurs over time with every machine as it cycles. Every time a new person is added to the workforce, there's always a learning curve that occurs. So the process must be built to compensate for the changes that you expect in your material. Often this time is plus or minus 5% variation, but many companies running regrind may have to compensate for as much as 25% variation. If you check the [inaudible 00:18:17] is in good working order, you can still expect another 1% or 2% variation, assuming the rest of the machine is still consistent. Hot runner system, cooling flow, sensor calibration will add even more variability to the mix. No process can compensate for production staff who lacks a consistent approach to process development, documentation, startup, and troubleshooting.

If you built your process to compensate for and/or correct for these variations, you'll lose the production time and increase your troubleshooting time. As a side note, when we get a request to teach techs how to troubleshoot, it tells us that the process was not properly built correctly to begin with. Your startup times for each process will also vary, making it nearly impossible for scheduling to anticipate when a mold will actually be running and making acceptable parts. Without a solid, consistent approach to processing, the root cause for rejects is often not properly identified, making scrap a reoccurring or inconsistent problem.

If you've heard the expression "100% inspection is effective 80% of the time," unaccounted variations and inconsistencies will eventually make it to your customer. The best functioning molders we've worked with do as much of the work up front. If the actual process is documented properly, it is much easier for someone else to repeat it. This brings us to a short discussion of the seven steps to scientific troubleshooting.

All of today's machines are velocity controlled. You must have a velocity controlled machine in order to do scientific molding. o the first step is have a machine where injection speed is not pressure limited. The transfer from velocity controlled injection to pressure controlled packing should be a short shot. This means all the cavities are short when packing or second stage is turned off. After transfer the mold cavities finish filling and are packed out using a steady amount of pressure. If your process meets the basic criteria just mentioned, then the effective troubleshooting techniques we will discuss will apply 100%. Scientific documentation should include plastic melt temperature, back pressure, and recovery time. Additional material information such as hopper resonance time, moisture content, dryer dew point reading can also be helpful data when troubleshooting.

During injection the short shot weight, fill time, transfer position, and peak are very helpful data. If you have a purge plate you can also gather additional data such as peak and transfer pressure during an air shot. Keep in mind, if you have to use an injection profile you should document the time and shot weight at each velocity change. The packing pressure, packing time, and final part weight are critical information to scientific molders. If for some reason you're forced to use two or more pack hold pressures and times, these should be documented, along with the part weight at each transition.

With respect to cooling, there's a lot of data which can be obtained. The most important information would be the cooling temperature going in and out of the mold, along with the cooling time. Flow meters, pressure gauges, temperature probes, and infrared cameras can also better document what is happening during the cooling phase. Tonnage and cycle time are also necessary, though many molders add useful information such as mold protection and clamp type to their documentation.

Always take the time to examine a defective part. This might sound simple, but I've been on locations where the operator tells a tech there might be flash and he jumps to the controller and begins pushing buttons without even looking at the part. Often times there may be helpful information such as ejector pin marks, or splay on the part. For example, if a nylon part has flash and splay, this could indicate moisture in the resin. This is where experience comes in. If you know machine number five needs a tonnage reset when the mold flashes you take care of it. Keep in mind, routine issues can become expensive over time and can often save lots of time and money when they're fixed.

Real scientific troubleshooting occurs when you make the effort to determine what changed. This is typically the key to finding the root cause of the defect. As mentioned earlier, verifying the first stage short shot weight, first stage time, and visual short is a great start. If the fill is significantly different, your final part will be different. Without knowing what made you a good part, you could not identify the change with any degree of confidence.

Once you determine what changed, you can begin to return the process to the documented standard. You can save time by focusing on the most likely causes. For example, you would not worry about mold temperature if you're fixing flash, but you would check it if you were troubleshooting part warpage. This is where your true causes are often found. For example, a high peak pressure and a light short shot might indicate a blockage or faulty heater band on the nozzle. Likewise, if the coolant temperature will not increase to the necessary temperature, the temperature controller is likely to have some sort of problem. Or maybe a water line has been throttled down.

One of the greatest benefits to this methodology is that it reduces the learning curve for new hires and trainees. This systematic process and standard procedures will get your employees to investigate the root cause in a much shorter amount of time. A scientific troubleshooter is not done yet. This step involves quickly verifying the process using parameters which are easy to verify. Then the tech is confident he or she is not going to be called right back for the same problem.

Documenting your changes is not only good troubleshooting but it's one of the most important aspects of process improvement. If everything that happens is documented, then you have a history to reference. This is not only great for the techs but deficiencies in the mold, material, machine, or process will be easy to spot over time. Encourage your techs to document process changes. It is important that they write things down. Although all this might sound simple, for most operations this is a major shift in the behavior of your production staff.

To compete today in our global plastics industry you need to be capable of implementing change. The most successful molders are the ones who are willing and able to take on new challenges. Your techs must be able to utilize new tooling, materials, and equipment you might buy. This will allow them to take advantage of the new technology. Lastly, there is always someone either producing or trying to produce what you are making, requiring you to keep improving to stay ahead of your competition.

So how does change occur in manufacturing? First, and most importantly, it requires management support and endorsement. These technological changes and product specifications are typically the job of your engineering staff. By maintaining the actual day to day persistence of change falls on the shoulders of your technical employees or techs. If they do not understand both the reason for the change and how and why it's done, sustainable change does not occur. People tell me all the time, "You don't understand. We don't have a lot of people to choose from in our area." The truth is, finding talented techs is a worldwide problem, and then keeping them is often expensive. I've seen companies spend tens of thousands of dollars on recruiters.

The truth is, if you can poach tech from another company, someone can poach that tech from you. If this is not bad enough, there are fewer and fewer avenues for people to develop technical skills. This has become a big problem in our industry. Just take a look around at the ages of employees at your company. When companies downsize, they always put more requirements on the techs. Additionally, a large percentage of the workforce has or will retire, further diminishing the available pool of technical talent. The ones left behind often become overworked, frustrated, and often leave.

Customer requirements and demands will never get easier, they always get tougher. You need to consistently implement new training methods, such as scientific molding, to continually improve. Purchasing the latest machine, process monitoring technology is never enough if structure and systems are not in place. New materials, additives, reinforcements, dimensions, designs, and the challenges for plastics industry are very, very dynamic. As the years pass on, many companies feel the pain of downsizing and key staff retirement, and this results in an inability to compete. Unnecessary scrap rates, setup times, and mold repairs can prevent your company from competing in today's global marketplace.

Your staff needs to constantly adapt and improve to keep your company profitable. Lately we have witnessed companies who cut back on maintenance now encountering large amounts of machine and mold damage. All of this negatively affects the quality and consistency of product the customer receives. So what do you do? Most companies rely on experts. Some poach talent from others. Several have sent techs away for training. Others even ask machine and material suppliers for help. All of these may provide some help in the short term, but none of these really fix the problem in the long term.

Here's a common industry example, the consultant or tech expert. He or she comes in and fixes your short shots. The new process compensates for normal variation and seems pretty stable. Something abnormal occurs and the customer gets another short. The technicians chock the consultant's work up as a fluke because they do not understand how to keep the process going. In the end, they keep making short shots and begin 100% part inspection, instead of addressing the root cause of the problem.

Now you can send someone out for a few weeks and they might even become certified. This can be a good way to learn some specific skills. But the application of scientific molding takes more than just one employee. Unfortunately in many cases all the untrained techs don't understand what's being implemented and they just put things back to where they were. If you ever heard the statement, "If I train my employees they will just leave," this is where it comes from. As a side note, we used to run an ad that said, "What do you fear more, your trained employees leaving, or your untrained employees staying?"

Lastly, let's review what happens when you overpay for talent. You assume that the new employee knows the technical part of the job, but it still takes a large amount of time to learn everything else they need to know about your company, its products, and your customers. All of this knowledge comes from the other technicians, who also transfer their bad habits, behaviors, and sometimes attitude. Most often the end result is a tech who does what the other techs have been doing. This makes it very difficult to hire new techs with the hope that they will help initiate change.

What to do? What to do? What to do? To make change stick, people need to understand why it's important. Without the "why" they don't pay much attention to the "how." If both the "why" and the "how" are not taught, there's little hope for change. People always revert to what is comfortable without identifying a really good reason on why they should be doing something differently. Experts believe it takes many months to truly change a learned behavior. Technicians must have a basic understanding of the causes of variability before they will want to process in a way that compensates for it. Remember, changing takes people out of their comfort zone. Then they need to practice to learn the related skill, and practice then on the job for a period of time so that they can master.

But none of this will ever stick if all the other techs are doing the same old thing. So everyone from management down needs to understand and support the new effort. To make this happen you need to train your employees with a knowledge element. This information must be consistent and relevant to their job, and the molding skills need to be learned and practiced. The use of different techniques will help employees learn quickly and efficiently. In reality they'll make some mistakes. This is okay as long as they learn. This is why cross-training should be an integral aspect to a long-term solution.

Lastly, the training must be ongoing so that you create a culture of learning. This is the biggest problem in our industry. Regular training is not being done. Instead companies treat training as a one-time event. Remember, if skills are not practiced they will be forgotten. Knowledge is the foundation of any rational change. Because we say so, or this is how we always did it is never a good reason for change, and your employees know it. Every employee comes to work each day wanting to do a good job, but they need to meet new knowledge. Knowledge and the development of real-world applicable skills will help replace their outdated views and give them a foundation they need to make better decisions.

So why use different techniques? Because most people are visual learners, others like a more scholastic setting, some techs have to hear something for it to sink in, while others have to get involved. I often hear, "Hands-on training is the best." This is not necessarily true. Hands-on training is very expensive and time consuming. Most people will get their a-ha moment once they have something explained in detail. Abstract concepts such as how plastics melt are better explained through animation. It is important that you develop your employee's skill through a practiced behavior rather than through an active behavior. Since we all learn differently, many employees love to get lost in the detail, while others want the big picture before they care about specifics, before they can grasp and finally apply.

Using different approaches to a topic will make the idea concrete. The more your employees know about what goes on around them, the more they care. This also makes them more helpful in many different ways. Again, everyone wants to do a good job, but management needs to give them the tools to succeed. You cannot maintain change if you do not continue the learning process. The learning process must be ongoing.

Without a culture of learning, you cannot introduce new change. Ongoing training is a necessary component to sustainable change. This also lays the groundwork for continuous improvement.

So we will quickly review a common example of a structured technical training program. We wanna emphasize structure. Your production employees need structure, so let's look at this example. This one's for teaching scientific molding, and includes a knowledge based element, behavior learning, and skills training. In this case, the online training uses many techniques, including visual, literary, auditory, interactive, and theory. The hands-on portion integrate many critical techniques, such as visual, auditory, interactive, and practical application.

In this example, they learn the all important "why," then they learn the critical "how." And since this occurs at the production facility, we suggest this because if your employees are working in an outside lab, the results are quite predictable. We need to see what happens in their environment. Many employees can become involved and will benefit. In fact, we suggest training everyone. Just a little bit of training will go a long way with your entire production department. Management can leverage everyone. This turns theory into learned behavior. Over time this process can be easily modified, making it a great way to incorporate changes over time.

As mentioned earlier, your techs are the key to implementing sustainable change. In order to have and maintain continuous improvement, you need to create a culture of learning. To develop this, you need a comprehensive and flexible training plan. This plan must provide the employees knowledge as well as skill development for learning new behaviors. So continuous training is a key part of continuous improvement. Now it's time to wrap up this presentation. In just a moment we'll have a few questions that I'll answer. Again, please call Routsis Training soon to reserve your four free training courses before the deadline. Don't forget to download your free molding guide and spreadsheet. These are great tools for any molder. Please give me a moment to scan through the questions you've already submitted and we'll begin the Q&A section. Thanks a lot.

Andy: And before I forget, I just wanted to thank Trey and everybody at IDES for helping us with this webinar. And we've got a few questions that have been posted. Let me just answer those directly to help you. All right, one of the questions go, "Why should I train everybody? I've only got a few people that really make any adjustments to my machines." Well, again, the idea is you should have ongoing training and train everybody, for the simple reason even if you have an operative that's putting parts into a box, if you could teach them some simple concept as to things to look for. For example, watch a process output, such as screw recovery time cushion size. If they see any bit of a variation they can easily bring this to the attention of somebody and help everybody get the problem solved.

Have a question here, "Where can I get the free guides?" The guides can be obtained just by contacting our office. Feel free to give us a call at 978.957.0700. And just ask for me, Andy, and we'll send you some guides. Or just email and we'd be happy to send you some free guides. And we'll ship these for free anywhere in the U.S. We've got a bunch of people from Canada so we'll have to sort something out as far as getting them there because the postage is rather high.

Okay, other questions that have come up... "How often do people go to outside facilities to train?" There's a fair amount of this going on because training takes place in my business at different training centers, also some of the community colleges in school. The problem with this is there's good information being taught, and let me just back up by saying our opinion is, any training is good training, but then it really comes down to applicability. How much of that can you apply to your specific workplace? For example, the machines, the tooling, and the types of molds that you run. Also, take a look at what that company is doing as part of their business. I mean, are these resident suppliers, are they machine OEMs? Are they people selling process control equipment?

Again, you wanna focus in on your world and what you're making at your particular facility, whereas a lot of these facilities tend to lean you toward things that relate to their products. And, you know, we work as independent trainers and we look to take everything into view. Again, a lot of what they're doing is quite good. They're teaching some information, but for example, and I have another question that came up here, somebody asking me something specifically for smaller molds. In fact, I'll answer that question, and I know that this isn't discussed at many of the training places. The question is, "For small molds, would a hot runner system still be more beneficial, or does it matter?"

Well, the answer is, "that depends," all right? Hot runner molds are great, but we have to make a lot of assumptions. We have to assume the right hot runner system was specified, and then is there truly a cost benefit associated with the hot runner? And again, plastics melt different. And again, this is an area that we'll talk about in training. For example, most people think plastics tend to soften as you heat them. That's true for a lot of plastics, but then there are several plastics that stay very rigid until a point, and then all of a sudden they melt all at once. So for example, a plastic like nylon, acetal, or polyester melts the way I just described. Plastics that soften, such as polystyrene, polycarbonate, acrylic, these tend to soften as you heat them.

Okay, "Will this webinar be available to view again?" Yes, it will be. It'll be posted in the next couple of days, so that should be absolutely no problem at all. "Where can I find the scientific molding spreadsheets?" Again, we'll be happy to email those to you. You're gonna enjoy those sheets because on the sheets you're not only able to put the data into the sheets but it also gives you step by step instructions on how to do that. Okay, "Do you provide training outside of the United States?" Yes, we do. We provide training globally, in fact. I just got back from Southeast Asia. We're literally all over the world. So again, any place that you'd like us to go we're happy to do so.

And let me just see if there's any other final questions here. Okay, the last question is, "What's the typical time frame for getting started on your in-house training programs?" Well, one of the things we do with our in-house training programs, whereby we go to your site, is we first set you up with some online training. And once you do some of that online training then the training for face to face training is done a little bit in the future so that when we go on site we're spending more time on your production floor teaching you methodology that applies directly to what you're doing.

Then there's also a post-training requirement that you have to do. So once our trainer leaves your premises, there's still other things that have to be done. And then we also have a lot of customers that will send us things like the typical worksheets that we teach them how to develop as well as photographs that show, for example, they can build a short shot progression, etc. Another question, "Is online training available?" Yes, it is. Online training is available on many subject matters. We have the most comprehensive library in the entire world on injection molding, and that's all listed on our website as well as the pricing. All the pricing that you see is per person, so if you're gonna train more than one person just simply change the quantity.

Let me make this point, too. Training right now from a cost point of view, it's now affordable to anybody. Anybody can afford training. In the years past training was really only a luxury for some of the larger companies, but now training can happen if you've got just one or two people, so it's quite easy to do. "Can you provide typical costs of your training on site in China?" Yes, we can. We do train now in China. In fact, we had a very large contract over in Malaysia that just was extended to another year, so we've done an ongoing training program there for four years. It's soon to be extended by another four years. So we do go all over the world. We also offer in multiple languages, so for example, we do have Chinese Mandarin, we have Spanish, we have Portuguese, we have Bahasa for the people who are in Malaysia or Indonesia. I'm trying to think, I think I missed a language or two but we do have several. And also the worksheets are done in the native language. So all of that, of course, is available.

Okay, well it looks like I've answered all of the remaining questions on the webinar. Again, I'd really like to thank everybody for participating in this webinar. Feel free to email me directly or to give me a phone call and I'd be happy to answer any of your questions, whether they have to do about training or if there's some little technical issue I can help you with for a few minutes on the phone. Again, thanks everybody, thanks to IDES and many thanks to Dyna-Purge. They have a great set of products, they're a great team, and they can help you quite a bit. Thank you, everybody.

Male 1: Perfect. Well, Andy, thank you so much for that. And again, just a reminder, we did have a couple questions come in about the availability of the webinar itself. We will be sending that to your email...