In everything from romantic relationships to pumping gas, compatibility is critical. If a cat lover hooks up with a feline fur allergy sufferer, for example, bet on a quick breakup; likewise you won’t get far by putting diesel fuel into a non-diesel vehicle. It’s a law that extends even to selecting the best cooling system for your plastics processing needs. Plastics part makers face an important choice when determining how best to cool their equipment: use a central cooling system, or use portable chillers that serve specific machines or manufacturing cells. There’s a variety of factors to take into account when deciding — cost, capacity, performance capabilities — but one consideration tends to get overlooked: the types of resins being processed.

“Resin is an important part of choosing a chiller — especially for custom molders who process wide ranges of resins — because each resin type has its own particular set of characteristics,” said Steve Wojcieszek, director of industrial markets with Thermal Care Inc. “This means that each is processed at a different temperature and gives up heat at a different rate.”

In other words, cooling one particular resin might require a larger chiller — i.e., a chiller with greater cooling capacity.
Among the common resins, HDPE represents a worst case scenario for cooling needs, the equipment vendors agree. “For injection molding, the rule of thumb is that cooling 30 lbs per hour of HDPE equals one ton of chiller, which translates into a larger chiller than is needed for cooling PS, for example,” Wojcieszek continued.

**SIZE MATTERS**

Key to matching chilling systems with resins is an understanding of how chillers are sized in the first place. “Chiller size is rated in tons per hour of refrigeration, based on a nominal coolant temperature of 50°F,” said Tim Miller, heat transfer sales, Conair Group. “One ton of refrigeration, or cooling capacity, is equal to 12,000 BTUs per hour, which is the amount of latent heat absorbed when one ton of ice at 32°F melts to water at 32°F during a 24-hour period. The size of a chiller is based on the tonnage required to deliver the lowest required water temperature to a ‘process heat load’, which is the sum of heat that must be removed from the molded or extruded plastic, mechanical heat sources in the process equipment, and the influence of ambient conditions.”

To the uninitiated, calculating the various heat loads of common resins, and therefore the detailed process load calculations, can seem as complicated as a NASA formulation. The good news is, it’s all been done for you. “The cooling system industry has developed timesaving guidelines — we call them cookbook formulas — that simplify the process of estimating heat loads,” said Ziggy Wiebe, owner of Chillers Inc.

But that doesn’t mean you don’t still have a decision to make: specifically, the choice between a central cooling system and portable chillers mentioned above. “Knowing what the resin is only tells us what the heat load is,” said Giorgio Santella, chief marketing officer with Piovan S.p.A. “After that, deciding between portable and central systems has nothing to do with the material — it has to do with the unique situation of a molding facility, and each one is different.” But some general rules of thumb apply, beginning with this: Since a typical central system is designed to deliver water at just one temperature, a processor running materials that require widely different processing temperatures may not be able to realize the economies that a central system normally provides. “If just one material runs at a lower temperature than others, the central system must be sized to deliver that lowest temperature,” said Tim Miller. “Therefore, the system will actually be oversized for the vast majority of the resins being processed.”

The key point, then, is how much variation there is in temperature requirements. “Typically, a cooling system needs two per cent more capacity for every degree of cooling below the nominal rating of 50°F,” Miller continued. “In other words, running just one material at 40°F will require a 20 per cent larger chiller.”

**PLAYING THE PERCENTAGES**

Under such circumstances, it may make sense to size the central system for all but the lowest temperatures and use portable chillers for any special materials. Which is where the benefits of a modular chilling system come in. “In a cooling system with multiple chillers that couple together to make a complete or expandable chilling system, you can add up to 12 chillers in one bank,” said Roger Lambert, president of Temperature Corporation. “Combined with chilled water and tower water pump packages, you’ll have a complete cooling system that can be expanded as your plant grows.”

The vendors differ on where — and what — the red line is that determines when a central system, supplemented by portable chillers, becomes a more practical solution than portable chillers alone. “When it comes to cooling temperatures, as a general rule, if 80 per cent of your resins are processed within a temperature range of plus or minus 5°F, you should consider a central chilling system,” Tim Miller said. Or the line could be drawn according to the number of portable chillers being used. “If half of your chilling system will be made up of portable chillers, the law of

Different resins give up heat at different rates. Thermal Care Inc.’s NQV series portable chiller with variable speed compressor reduces the electrical usage to meet a reduction in heat load.
chillers
diminishing returns dictates considering one central system with temperature control units instead,” said Adam Zyskowski, sales manager with Berg Chilling Systems Inc.

What all the vendors agree on, however, is that the solution will vary from plant to plant, beginning with the specifics of the molding process. “Typically, blow molding and blown film extrusion require only one water temperature throughout the entire facility, in which case a central system makes sense,” said Al Fosco, global marketing manager with Frigel North America. “Injection molders — especially custom injection molders — process wider ranges of resins and therefore need different cooling temperatures, which makes them better candidates for portable chillers, perhaps supplementing a central system or perhaps not.”

Other considerations such as available floor space, cost of installation and operation, and even the age of the facility can play roles, too. “I’ve seen large-scale automotive part making shops that run entirely on tower water,” Adam Zyskowski said. “They’ve accepted operating at 50 per cent production capacity during certain times of the year due to warmer tower water temperatures, but they tend to have aged, antiquated plants. For a brand new plant with new injection molding machines, however, the best solution is to choose a cooling system — whether centralized, portable, or a mix of the two — that allows you to cool the product faster to maximize production.”

Compatibility never sounded so cool.

RESOURCE LIST
Advantage Engineering Inc. (Greenwood, Ind.);
www.advantageengineering.com; 317-887-0729
Chillers Inc. (Newmarket, Ont.);
www.chillersinc.com; 905-895-9667
Berg Chilling Systems Inc. (Toronto);
www.berg-group.com; 416-755-2221
Conair Group (Cranberry Township, Pa.);
www.conairgroup.com; 724-584-5500
Dier International Plastics Inc. (Unionville, Ont.);
www.dierinternational.com; 416-219-0509
Industries Laferrière (Mascouche, Que.);
www.industrieslaferriere.ca; 450-477-8880
Turner Group Inc. (Seattle, Wash.);
www.turnergroup.net; 206-769-3707
Frigel North America (East Dundee, Ill.);
www.frigel.com; 847-540-0160
Hamilton Plastic Systems Ltd. (Mississauga, Ont.);
www.hamiltonplasticsystems.com; 905-890-0055
Piovan Canada (Mississauga, Ont.);
www.piovan.com; 905-629-8822
Temperature Corporation (Markham, Ont.);
www.temperaturecorporation.com; 877-913-8310
Thermal Care Inc. (Niles, Ill.);
www.thermalcare.com; 847-966-2260
D Cube (Montreal); www.dcubeca.ca; 514-831-5623
Tantus Corporation (Pickering, Ont.);
www.tantuscorp.com; 647-258-9657

POUNDS OF PLASTIC INC.
www.poundsofplastic.com
16 Falconer Drive, Mississauga, Ontario L5N 3M1
PH: 905-286-9894 • FA: 905-286-9893
rpounds@poundsofplastic.com

Omnilon™ Omnipro™ Omnitech™ Omnicarb™ Many unique and specialized nylon 6 and nylon 6,6, polypropylene, ABS, PBT, PET/polycarbonate and polycarbonate/ABS compounds.