Blowing hot & cold

The importance of maintaining certain goods at specified temperatures cannot be overstated. John Kendall looks at the issues behind training technicians responsible for this equipment

Controlled temperature transport might simply mean reefer bodies to many. But there's a lot more to it for those involved with the business every day. What might seem like a straightforward matter of maintaining a required temperature during transit, using a refrigerated body system, is just the tip of an engineering iceberg.

Curiously enough, in a sector as heavily regulated as transport, there is comparatively little legislation relating directly to the operation of refrigeration equipment. Food hygiene regulations deal with how food should be handled in transport; and 'O' licence regulations determine the frequency of vehicle and trailer testing. But, for instance, there is no requirement for refrigeration equipment to be regularly maintained or inspected.

In practice, no reputable cold chain operator would gamble on maintenance in a sector where customer demands on accountability and uptime are so high. Pharmaceutical companies are likely to require close monitoring of loads, while different foods also have distinct transport requirements.

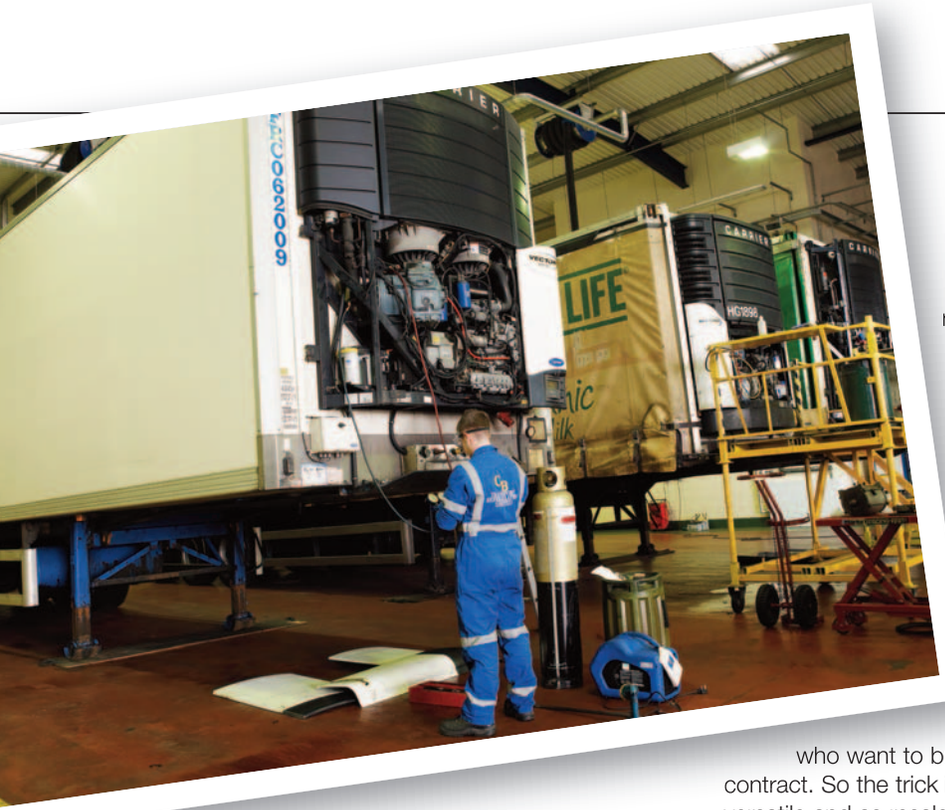
Hence the ATP (Agreement Transports Périssables), relating to the international carriage of perishable foodstuffs, lays out comprehensive guidance covering transport temperatures for various types of foods. It also covers the associated insulating properties of materials used in body building, as well as appropriate types of refrigeration equipment and their performance. And translating that guidance into reality are technologies such as remote temperature monitoring, via GPS or GPRS, and temperature recording systems.

Carrier Transicold is one supplier that has its own in-house City and Guilds accredited training school. "We provide technical training to all our technicians through that school," says Scott Dargan, operations director at Carrier Transicold UK. "We also provide customer and operator overview courses, so we will take them through the basics of how different transport refrigeration systems operate and then through the cold chain – which is really understanding how to keep integrity all the way from the field to the fork." That encompasses best loading practices, how to operate the refrigeration system most efficiently and how to maintain those temperatures all through the cold chain.

Fridge componentry

Mechanical refrigeration systems are the most commonly used, whether powered electrically, driven off the vehicle engine or by a separate refrigeration diesel engine. The same four basic components are present in each – an evaporator, condenser, compressor and a metering device. The evaporator is located inside the fridge body, incorporating fans to distribute cooled air. Meanwhile, the condenser is usually fitted outside the body – often visible on the roof of the vehicle or front wall of the body – and disperses heat removed from inside the body via the evaporator. Then the compressor is basically a pump used to pressurise the refrigerant gas. And, finally, the metering device creates the necessary pressure drop in the refrigerant for cooling to take place.

The need to maximise operational efficiency means that today's focus is on using composites – carrying goods at different temperatures for the



majority of cold-chain operators. That means carrying chilled, frozen and ambient temperature cargos in the same vehicle.

"There are different ways of doing that," says Chris Heeley of Hitachi Capital Commercial Vehicle Services. "You can use movable or fixed bulkheads, having either a single evaporator, with fans inside a bulkhead to draw air from the frozen to the chilled compartment, or a twin evaporator system, which involves two separate compartments. [The latter] are ideal for food operations, because you get less bacteria transfer between the two compartments."

Carrier Transicold's Dargan gives the example of a three-compartment supermarket trailer, with a front compartment that might hold fresh fish at 2—3°C, a middle compartment that might be at –24/25°C for ice cream and a back compartment carrying bread and bananas at ambient. "We can look at the parameters on the logic of the unit and decide the most efficient way of operating to save fuel", says Dargan. "We can set the systems up to run a stop/start cycle and look at the temperature variations when the units cycle in and out. We can do a full appraisal and then maybe load some new software settings, so they can get better performance out of the units."

And he adds: "At the most basic level, [training] would cover how to turn units on and off, how to operate them, how to load products correctly, so they get better airflow, and aspects such as pre-chilling the box." Dargan also explains that some people expect the refrigeration unit to pull the temperature down, "It's not there to do that; it's there to maintain the temperature," he warns.

Meanwhile, Heeley says several manufacturers of refrigeration units and refrigerated vehicles are looking into how they can provide fuel and carbon emissions saving – by examining temperature profiles and the design of the units themselves.

One alternative for refrigerated transport is to build an insulated container body with a separate cold source, such as a eutectic plate, which relies on heat transfer in electrical conductors. "The main problem for companies going down the fixed bulkhead route is resale value", he says. "Different configurations are required inside vehicles; [fixed bulkheads] tend to reduce the number of customers who want to buy those vehicles at the end of contract. So the trick is to try to make something as versatile and as resaleable as possible."

The gases used in air conditioning and refrigerant systems have also been under the spotlight for some years. The most important issue for the industry here is the F-Gas Regulations. These came into force in 2007 and require that technicians are qualified to handle refrigerants having global warming properties, such as R404A, which is commonly used in vehicle refrigeration systems. "That has a global warming potential of 3,260, which means 1kg is the equivalent of 3,260kg of carbon dioxide", explains Dargan.

Operators of refrigeration plant are also obliged to prevent leakage of the refrigerant and conduct regular leakage testing. The testing, which must be carried out by qualified personnel, varies in required frequency between three months and a year, depending on the quantity of refrigerant in use. Also, records must be kept for each system containing more than 3kg of refrigerant, detailing quantities added and recovered. Moreover, where gas is removed, it must also be properly recovered by qualified personnel.

"There are now increasing moves to look at alternative refrigerants," comments Dargan. "These include ammonia and carbon dioxide, but these don't really suit transport applications."

As for temperature recording equipment, used to monitor the temperature inside a refrigerated compartment, there are mandatory standards here, too. Where the equipment is to monitor the air temperature around quick-frozen perishable foodstuffs, it is required by law to be calibrated to satisfy standard EN 13486. And crucially, the recorded data must be stored for at least one year, depending on the nature of the food. TE

Scott Dargan, operations director at Carrier Transicold, says his company is rightly proud of its in-house, City and Guilds accredited training school

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