At every Olympic and Paralympic Games we see new and exciting technology used by athletes, officials and the media. In athletics, we can look back to the first major international use of synthetic tracks, automatic timing and electronic distance measurement as examples. At times a product that is destined to be applied for performance reasons commercially benefits from the exposure at the world’s biggest sporting event.

But what we see on television is just the tip of the iceberg. In the run-up to the Games and behind the scenes other technologies are also introduced, developed and disseminated to better prepare athletes, and their coaches, for top performances.

London 2012 was no exception. The aim of this article is to highlight some of the technologies we saw at the Games. These have been categorised as:

1. Athlete apparel
2. Athlete equipment (Paralympic specific)
3. Officiating technology
4. Broadcast and media technology

Athlete Apparel

The most visual and commercially driven innovation seen in London was in the sprint events. In what was called Project Swift, Nike developed a low-drag, all in one race suit that featured different zoned fabrics to manipulate airflow over the body (see Figure 1). Based on test data from wind tunnels, it was claimed that the suit could reduce sprint times over a 100m by 0.023 seconds. It is assumed that this time gain is based on comparison with Nike’s previous race suit. Leading athletes on the US team used the new suit in both the Olympics and Paralympics (http://nikeinc.com/news/track-field-nike-pro-turbospeed-uniforms-and-nike-zoom-spikes).

There was also further development of sprint spikes and other running shoes. Lightweight components, customised fit and cushioning were further tweaked to support perfor-

Figure 1: Zoned fabric race suit developed by Nike for the London 2012 Olympic and Paralympic Games
Paralympic Equipment

Some of the more significant technological breakthroughs were seen in disability athletics and particularly in wheelchair racing. It has become apparent that athletes in these events have been learning from the technological developments seen in Olympic cycling and triathlon. This was demonstrated by the headwear used by David Weir (GBR) and Marcel Hug (SUI), which was selected on the basis of wind tunnel testing (see Figure 2).

A good example of the use of such techniques can be seen in an online article published by the BBC (http://www.bbc.co.uk/news/health-17625958). Much like the Nike aerodynamic suit, the aim of the technology we saw in London was to reduce the air resistance so that with the same physical effort the athlete can go faster.

Material science in metals, carbon fibre and rapid prototyping was also been seen in the development and use of prosthetics and wheelchairs. Improvements in the athlete fit through

Figure 2: Aerodynamic headwear used by wheelchair athletes

How much difference does technology make in the Paralympics? The debate around the use of prosthetic blades not withstanding, it is clear that technology is now a critical component in enabling and supporting Paralympians at the highest level (http://www.ossur.com/?PageID=13462). In this case, the margins of gain are much easier to measure and we can see that the athletes with newer, more advanced equipment are far more likely to be on the podium than those with older or more rudimentary technology.

But did the latest kit ensure that, for example, David Weir won the four golds he did from the 800m to marathon? I think he was in such good form and had such good tactics, that he might have won with any reasonable equipment. Regardless, the fact he went though the process around using such equipment shows his mentality to winning.

**Officiating Technology**

Omega has been the official timekeeper of the Olympic and Paralympics Games since 1932 and they continue to innovate in their development of the measurement technology used to discriminate start and finish times.

A number of new developments were seen and experienced by athletes, spectators and officials. Of special interest to athletes and athletics fans, in London, the runners’ reaction time in the sprint events was obtained entirely by the measurement of force against the back block and not by movement (see Figure 3). Omega also supplied a new Quantum Timer that measured time accurately to a millionth of a second. With the new blocks a false start was triggered when the athlete exerted pressure above the allowed limit (indicating movement) within 100/1000ths of a second of the gun being fired. This improved the ability of the officials to ensure a fair start, which is good for the competitors, the fans in the stadium and the television audiences.

The blocks were also improved from the sprinter’s point of view. The centre bar on the new blocks is thinner, reduced from 80 to 50 mm, and the footrest is expanded, from 120 to 160 mm. The new configuration allows for different starting positions and is especially for women runners.

Athletes and fans also experienced a new starter’s gun allowing the audio start signal to be heard over the public address system (see Figure 4).
Broadcast and Media Technology

Finally, it is worth noting the breakthroughs in the experience for fans and spectators at the Olympic and Paralympics Games. The infrastructure around the Olympic park saw over six kilometres of fibre optic cables carrying ultra high-definition video – 16 times the quality of HD television.

London 2012 was the first Olympic and Paralympic Games to feature and use live 3D television using 33 true 3D live cameras to capture more than 230 hours of coverage throughout the Games. Audiences could view live HD coverage from their desktops; switch between 24 simultaneous live streams; rewind live coverage; and provide live data, statistics and information at your fingertips.

Summary

Technology and science continue to push the boundaries in high performance sport for athletes, coaches, officials, fans and spectators. The London Olympic and Paralympics Games were no different. This article has showcased a few of those innovations and shown how technology is now an integral part of the sporting experience.

Please note: the author has no involvement with any of the commercial companies or products mentioned in this report.

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