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The Hobbit: Quest for 3D magic

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Director Peter Jackson and actress Cate Blanchett on set



Hobbit starts on a

Clive Couldwell learns about the innovations used to film Peter Jackson's latest blockbuster.



One of the RED Epic cameras on a TS5 rig



The Hobbit: An Unexpected Journey is breaking new creative ground, but it has taken technological steps forward to do so. Director Peter Jackson decided not just to make *The Hobbit* at a faster frame rate of 48 frames per second (fps) – compared with the usual 24fps first adopted in 1927 – but also in native 3D.

Shooting *The Hobbit* in 3D sets it apart from *Lord of the Rings* which was filmed in 24fps 10 years ago. It's thought that Jackson's decision to film at 48fps (for release in High Frame rate 3D – HFR 3D) was to try to make 3D clearer, and to eliminate the potential strobing and blur that's caused when the cameras are moving.

"The 48 frames absolutely help 3D because suddenly you're removing a substantial amount of the motion blur that you get at 24 frames, and your eyes get a much smoother experience," says Jackson.

Early reports from the critics have focused on whether or not HFR 3D is the best way to watch *The Hobbit*, but using stereoscopic cameras to explore the film's settings and make the audience feel as though it is totally immersed in *The Hobbit*'s world has undoubtedly been the right decision for Jackson's latest creation.

The growing popularity of 3D action blockbusters has led to a renewed interest in HFR (which has taken 30 years to develop) and achieve new standards in realism by eliminating the flickering image quality of 3D film.

"I think for most people and certainly for creative types they'll see HFR for what it is, which is option value," said Paul Salvini, Christie's chief technology officer. "It's a new opportunity to do things in a

new and better way. It's not something that you have to use. It's something that when it makes sense you have the creative freedom to use. Over time we will see more directors and cinematographers understand and explore the medium."

But what really imbues *The Hobbit*'s scenes with new intensity are the custom-made RED Epic cameras, 3ality Technica rigs, and the motion control technology which allowed Jackson to film actors performing their scenes simultaneously on two sets to create perspective tricks in HFR, rather than piece scenes together in post production, as has traditionally been the way.

"We were breaking new ground," said Alex Funke, the special effects whizz and motion control supervisor on *The Hobbit*.

The Epic – a 2D camera – sports a 5K resolution and can shoot up to 120 frames per second. *The Hobbit* was one of the first productions to use it. The Epic's small size and relatively low weight makes it perfect for 3D, which uses two cameras mounted on a customised support structure.

"The RED Epics didn't exist when Peter first decided to shoot *The Hobbit*. They were the smallest high res cameras on the market at the time. To some extent they still are, and they record on memory cards on board the camera," says Steve Schklair, CEO of 3ality Technica whose small and light TS5 rigs have been designed around the Epics.

Epic challenges

Schklair's first big challenge was to develop a system that would help control cameras wirelessly and allow them free movement away from the

Martin Freeman as the Hobbit Bilbo Baggins



Using two motion control rigs allowed differently-sized actors to interact in one shot

technology quest

constraint of cables. This hadn't been done before.

"This wireless ability makes 3D work like a 2D film system, where you take the camera wherever you want. This was one of the big innovations we had to come up with relatively quickly for *The Hobbit*," recalls Schklair.

His second innovation was the use of stereo image processing (SIP) and the TS5 rig: "This was one of the reasons we shot the film at 2D speed. The biggest technical issue when shooting 3D is creating a comfortable 3D image. This means that every pixel from the left camera has to pretty much line up with the identical pixel from the right camera. If they are not in alignment your eyes have to work hard to fuse those images," says Schklair. "If we hadn't been shooting with the SIP and TS5, or other equipment, it would have involved a lot of fixing of the images in post production – a very expensive process."

The SIP analyses images in realtime and sends back a constant stream of commands back to the TS5 camera rig to keep it in constant alignment. "If you're using a zoom lens, then every fraction of a millimetre on that zoom is going to require a different alignment than the last frame to keep things perfect," adds Schklair. "SIP measures down to hundredths of a pixel for alignment. Most people would be satisfied if they were within five pixels. We're not satisfied unless we're within one."

In the past, director Peter Jackson had to shoot characters of different sizes at different times and piece the scenes together in post production. "There was no way to direct the whole scene at once, no opportunity to finesse performances," says Funke. »

Jackson: "48fps made things smoother"



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Shooting at 48fps helped make the live action sequences realistic, and the Epic rigs were small enough to use on tight sets



"Say you're shooting the dwarves and Gandalf the wizard in one shot. Usually, this is two passes of motion control, each with their own green screen and then dropped in on a different scale."

Adds Schklair: "On *The Hobbit* they developed a way of using two motion control rigs simultaneously so the actors could all be there in front of the green screen, interacting with one another. The rig let them shoot scaled figures in the same shot. This certainly boost performance because the actors could react to one another at the same time as them being on screen."

The benefits of 48fps

Feature films are usually shot at 24fps. When the first talkies came out, sound was acceptable and images were fairly smooth in their movement. What 24fps was never good at though was fast movement.

"*The Hobbit* contains a lot of action, and now that we're digital there's no need for the film to be in 24fps. Projectors can run at any speed. Cameras can run at many speeds so why are we still making films at a compromised frame rate like 24fps, which is terrible on fast moving objects.

"It's a legacy that should have been abandoned when we switched over to digital," says Schklair.

Sony SXR D R220 and R320 projection systems can handle HFR, including 48fps and 60fps. SRX-R320 projection systems require a software upgrade to existing LMT-200/300 media servers. The SRX-R515 4K digital cinema projection systems already have the HFR software.

Christie's Solaria Series digital cinema projectors can be upgraded to show feature film and alternative content released at 48 or 60fps. Version 2.2 of the Solaria software runs Christie Previsto HFR technology. Christie's integrated media block – Christie IMB – is added to Solaria to provide full 2K HFR 2D and 3D support.

Barco's Series II projectors have been ready to display HFR images for over a year now.

"48fps certainly made the fast moving sequences in *The Hobbit* so smooth. Fast sequences at 24fps tear your eyes out. For the director 24fps also slows everything down – action, camera pans – in terms of horizontal movement in the frame. 48fps gives you freedom to move the camera in ways that haven't



CGI characterisation let characters look like they did in *Lord of the Rings*



PHOTOS: WARNER BROS. PICTURES

been done before. Images are also sharper," says Schklair.

You can appreciate this smoothness in many of *The Hobbit*'s CGI sequences. "The nice thing about working with the Epic is that you're shooting in such high resolution that you can make minor adjustments to the frame without compromising the pixels," says Schklair. "Because you're shooting at 5k you're given a little extra room outside the frame you need so if there have to be shifts in position to accommodate effects, you can do this without having to scale the image.

"Effects guys don't want to work on scaled images, especially when they're trying to do complex mapping work and scoping because as you scale you start blurring edges which are difficult to deal with in post production."

Technology direction

The best technologies are not developed for their own sake but to help you make a better film or tell a better story. "Everyone goes to be entertained, be immersed in a great story and characters. No-one cares about the technical aspects when you're watching a movie. So if this new technology helps you tell a better story then it's great technology," says Schklair.

"It always takes a couple of things to develop a great technology for movies. Generally, when you're working to a budget there's usually some time and development money to build these last-minute technologies to help improve the filming process. Then you need a producer and director who have an interest in pushing the boundaries. It's exciting telling stories in new ways. Peter and his group in New Zealand definitely did that." ■

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