Digital Cinema in 2009

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Despite the economic downturn and credit freeze, box office has been up for 2009, giving motion pictures a glow that the entertainment industry sorely needs. The exhibition industry's good health, however, has not translated to the massive capital expenditures for D-Cinema equipment hoped for by so many manufacturers. The credit freeze has either dried up funding sources or made the cost of capital too expensive for those who hope for an accelerated rollout. In spite of the obstacles, the growth of D-Cinema screens has not been stagnant. The good news is that more U.S. installations took place by mid-2009 than during the entire 2008, led by the installation of digital 3D systems. Remarkably, the growth rate outside of the U.S. has been even higher, with the number of digital screens worldwide having passed the 10,000 mark as of mid-year. The bad news, for distributors, is that the growing digital footprint is scattered with only a few new digital (mostly 3D) screens per complex. Distributors need 100% digital conversion of sites to fully benefit from the efficiencies that the digital distribution promises.

Figure 1 shows the growth of screens in the U.S. over nearly a four-year period (yellow curve). The lower (green) curve shows the growth of 3D screens, clearly showing that 3D installations are leading growth. One should remember that the cinema industry is driven by content, not technology, and these installations are spurred by the tremendous slate of 3D movies coming from Hollywood. To name just a few of the 3D releases in 2009, movies such as Dream Works Animation's *Monsters vs. Aliens*, Disney Pixar's *Up*, and Fox's *Avatar* have been credited with driving system sales.

Despite the popularity of 3D, the industry has not lost focus on total conversion. This year, the top three circuits in the U.S. announced their intent to install 4K projection technology throughout. This is

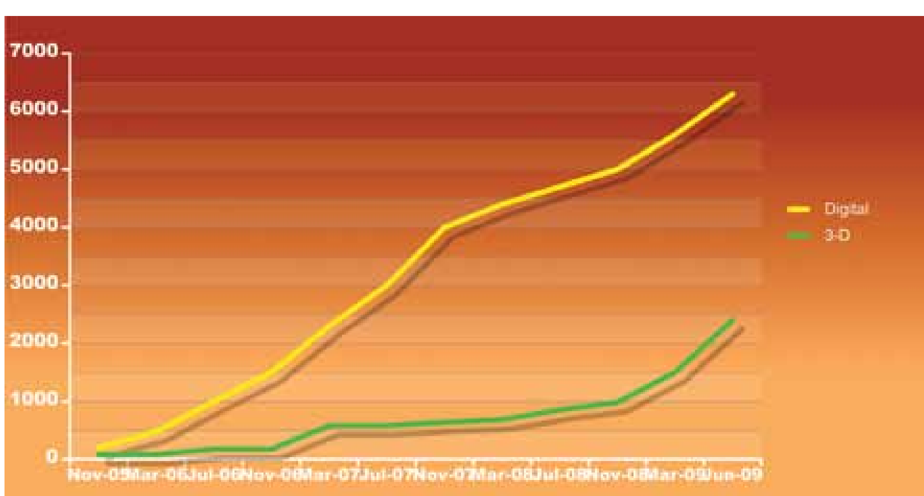

Figure 1. D-Cinema Installations (U.S.).

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a major switch because two of these circuits were committed to 2K technology only a year ago. One might ask if the change is due to a concern for presenting higher quality images to those who sit close to the screen or to the marketing power of the 4K number. Interestingly, the announcements for 4K are somewhat incongruous with the 3D trend because there is no such thing as 4K 3D in D-Cinema. SMPTE D-Cinema standards and the DCI specification permit only 2K 3D. Still, the fact that sights are set on 4K flags the desire for total conversion of screens, not just a partial conversion to digital 3D.

The 4K trend will cause a shift in the way D-Cinema technology is packaged and sold. Although Sony Electronics has always been on the 4K projection path, competitor Texas Instruments only this year announced its intent to produce a 4K DLP light engine that will install in its forthcoming Series 2 projector. Logistics come into play. It would require eight HD-SDI cables (4x dual-link) to carry 12-bit 4:4:4 color to a projector if an external 4K server were used. The sheer expense and clumsiness of such an interconnect guarantees that 4K media blocks will always be internal to 4K projectors. However, internal media blocks must still be accompanied by off-the-shelf storage and a screen management system (SMS). As internal media blocks and the servers that drive them become commodities, the 4K transition will spotlight those companies that successfully navigate the migration from hardware producers to software entities.

This year, the SMPTE 21DC Technology Committee completed its work on the digital cinema package (DCP). The development work for this began in late 2001, producing 16 standards, including affiliated documents. The SMPTE DCP, as it is often called, incorporates 2D, 3D, 24 frames/sec, 48 frames/sec, and 2K and 4K images, as well as up to 16 channels of audio in labeled formats. (The exception, as mentioned earlier, is that 4K content cannot include 48 frames/sec and 3D images.) The flexibility of the format well exceeds that of 35mm film.

SMPTE DCP also breaks ground in the cinema industry by identifying at the standards level how hearing impaired (HI) and visually impaired narration (VI-N) audio tracks are to be carried by the several multichannel audio formats. The standards also break ground by describing how cinematic closed captions (captions that can be presented to only one member of the audience) are distributed. Similar capabilities in film systems are possible, but require proprietary systems that are not standardized. D-Cinema not only standardizes how to provide such features, but it does so on a royalty-free basis.

Additional work on standardizing the communications between server and third-party closed caption system has also made great progress. At the time of this writing, two documents are in ballot to define the Content Synchronization Protocol and Resource Presentation List (CSP/RPL). It is hoped that these documents will be published as standards by year-end. It is equally important that the new protocol be quickly implemented in D-Cinema systems to meet the high demand by the U.S. exhibition industry for closed caption support.

The popularity of 3D movies led to the unexpected discovery that 2-D on-screen subtitles are uncomfortable to watch when the focal point of the 3D scene is not at screen plane. As a result, a change to the SMPTE DCP is now in discussion to allow distribution of 3D subtitles. Solutions for 3D closed captions are also being explored by the manufacturing community.

Cinema advertising has received no attention to-date, within SMPTE. This is largely due to the fact that the aggregating entities in electronic cinema advertising are still using customized projection equipment that does not meet D-Cinema standards. However, as D-Cinema rolls out, it is unlikely that the duplication of electronic advertising hardware will continue, and the need to run advertising on D-Cinema equipment will emerge. To this end, the D-Cinema industry might look over the shoulder of the SMPTE 30MR Metadata and Registers Technology Committee and consider efforts such as SMPTE RDD17 from Ad-ID for tagging MXF files.

Digital Cinema Initiatives (DCI) compliance testing began this year, but not without wrinkles. After manufacturers targeted their designs to DCI's Compliance Test Plan (CTP) v1.0, DCI introduced additional tests in its 2009 v1.1 release. Although the changes were within the bounds of its Digital Cinema Systems Specification v1.2, several manufacturers were forced to re-evaluate their designs. The achievement of DCI compliance in the field will likely take place in stages. April 2010 is the target for introducing SMPTE DCP, which could take up to a year to achieve worldwide conversion. Firmware upgrades to full DCI-compliant security will follow as closely as possible. Full compliance, however, could be elusive, as the 500-page CTP is presented as a pass/fail test. Several manufacturers have expressed concern that no product will pass 100%, leading to the approval of exceptions on a studio-by-studio basis. The elusiveness of compliance is of particular concern to funding sources, as the requirement for equipment to be DCI compliant is written into all financing agreements.

In summary, although more D-Cinema installations have already taken place in 2009 than in 2008, the massive, concentrated, long-promised U.S. rollout is unlikely to start this year, if ever. Given the shape of financial markets, it is more likely that funding for such rollouts will come in bursts, as investor priorities change, confidence improves, and the cost of capital becomes more advantageous. Most certainly, funding efforts will first focus on expanding the digital 3D footprint before increasing the breadth of D-Cinema projection. The new demand for 4K systems will inevitably change the nature of the equipment market as media blocks move into projectors. Furthermore, the introduction of SMPTE DCP and its capability to support accessibility features for cinema will eventually allow exhibitors to offer these new capabilities to patrons.