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OLIVER

A significant advance in the Motion Picture Film Industry

With a history of film transfer going back 70 years and over 750 scanners in daily use globally, Cintel is internationally renowned for pushing the technical boundaries of film scanning and image data creation.

This paper discusses Cintel's latest technological innovation, OLIVER, which effortlessly eliminates the film industry's greatest headache – the effect of dust and scratch on film

It is unusual to find significant technical advances in an industry as mature as the film industry. However Cintel's Oliver is such a dramatic advance that it may change the view of many as to the continuing use of motion picture film and it could also revolutionise film archive restoration facilities.

Film, especially 35mm, is regarded by most, as the ultimate in motion picture acquisition, not only for its superior resolution qualities but also for its ability to accurately represent the full tonal range and texture of any scene. Additionally the film image is generally stable with an expected archive life of over 100 years.

However film, or rather the film's protective coating is a relatively delicate material living in a mechanically harsh world. Film has to survive intermittent motion in the camera, processing, manual handling when being edited and has to cope with multi-pass high speed transport over devices such as film scanners and film projectors. Most of these operations also occur in less than ideally clean environments.

The consequence of these issues is that the film surfaces become worn or damaged and dust builds up on the same surfaces.

The film image is almost universally recognised, not only by its quality, but also sadly by the lines, cinch marks, scratches and dust that reside on these surfaces.

Proponents of an "All Video World", often refer to the disadvantages of film in terms of these visible artefacts.

Reducing visible damage

The film industry currently has many processes to minimise the unwanted blemishes on an otherwise perfect film image.

In the film printing industry "Wet-Gates" are common for printing inter-positives or inter-negatives. While in the video and data scanner industry, various light source diffusion techniques have been applied to slightly reduce the artefact visibility, and some "Film Lab Competent" scanner users have adopted wet-gates on the scanners to achieve the same results as the printing industry.

In general it is recognised that, for high quality video or data images from film, a post scanning "Dust and Scratch Busting" process is still required. This is time consuming, expensive and less than perfect. All scratch and dust busting, apart from wet-gates tend to leave some minor witness marks where the process has been applied.



While wet-gates perform very well on scratches, they suffer in other respects. They will not, for example, remove dust marks. Indeed the dust can float across the image causing streaks and may also clog or damage the scanner's seals.

The greatest problem with wet-gates is the liquid itself. Perchloroethylene is very environmentally unfriendly. It must be contained within the system and not vented to the atmosphere, and must be filtered, re-condensed and replenished. Therefore the wet-gate liquid support system is cumbersome and expensive. Moreover a separate gate is required for each film format, and finally the liquid leaches the plasticiser out of the film, causing the film, after multiple passes to become more brittle.

Summarising, a wet-gate solution is good at scratch removal from the image but, it does nothing for dust, is environmentally unfriendly, incurs a high running cost and it damages the film.

OLIVER – an alternative to traditional methods

Oliver (formerly referred to as "Optical Scratch Concealment and Removal – OSCAR") can be regarded as a solid-state electro-optical wet-gate and a dust and grease mark remover all bundled into one compact unit.

Oliver uses no liquid chemicals of any kind. It is truly solid state. It also operates in real-time and all scanner features and benefits are retained without compromise. There are no on-going running costs associated with Oliver, and it is a fit and forget device.

Oliver's operational details are proprietary to Cintel, and this paper describes the principle physics of a film image and explains how it is possible to recover a pristine film image from badly damaged film.

The principles of a film image

Side view of film



Fig 1

Fig 1 clearly shows that the film image layers are "sandwiched" between two protective layers. The thicker layer, known as the support layer and the protection layer over the emulsion.

Fig 2

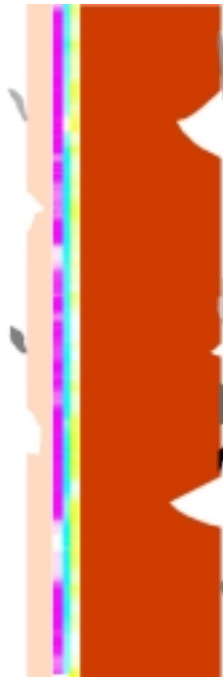


Fig 3



Fig 2 shows that most scratches never “attack” the actual image, but instead reside in the protective layers and the dust lays on the surfaces.

Fig 3 shows extreme damage where the scratch has penetrated the emulsion protection and physically damaged the image. In this instance manual post production scratch “replacement” would be needed. However such damage is very rare on camera negative or intermediate materials.

This type of excess damage would only normally be seen on very worn projection prints.

Using traditional methods

Wet-gates fill the scratched area with Perchloroethylene which has the same refractive index as the film’s protective layers. In other words it really forms a new temporary coating which removes the diffraction caused by scratches. However any dust or greasy contaminant, such as fingerprints, on the surface will still reduce or deflect the amount of light passing through the film.

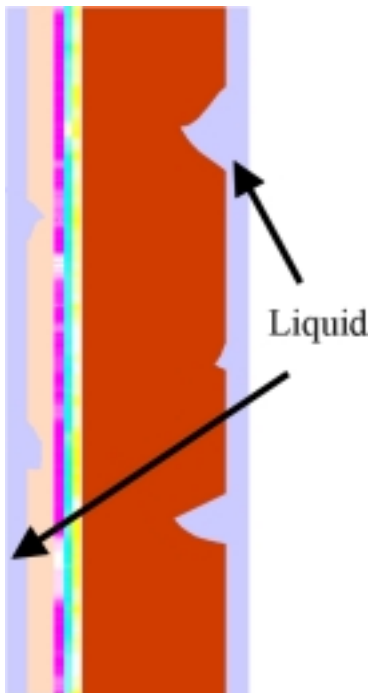


Fig 4

A much less effective, but easier solution is to utilise a diffuse light source for CCD scanners or simple diffuser after the film plane on flying spot scanners.

To a certain extent both systems reduce small scratches and cinch marks but they are nothing like as effective as wet-gates.

In addition CCD diffuse light sources tend to soften the image and its sharpness as the diffuse light hitting the films dye layers at different depths causes a slight blur around the grain or dye structure of the image.

The effects of OLIVER

Fig 5 Scratch – before OLIVER



Scratch – after OLIVER



Unlike other systems, Oliver can see around almost any surface contaminant including, dust, scratches, cinch marks, finger prints, tape splices, cement splices and even some large surface area opaque materials, and gather the original undisturbed film image.

It is almost as if the protective layers have been removed such that the scanner sees just the dye layer image. As far as we know no other system can perform this “magic”.

About the only time Oliver is less than perfect is when the dust is 100% opaque. And such dust particles are few and far between.

Fig 6 Dust and Scratch – before OLIVER



Dust and Scratch – After OLIVER



Fig 7 Finger Print – before OLIVER



Finger Print – after OLIVER



Fig 8 Original scratched image



No "Evidence" of scratches removal



Because Oliver works with the real image, it leaves no "witness marks". This is unlike downstream dust and scratch busting where the image is replaced with an approximation of what is correct.

Oliver has been described by others as a "A film restoration projects dream" and as "A system that makes de-spotting and dust busting systems largely redundant".

Benefits of OLIVER

In many respects Oliver is unique. It replaces all past systems for scratch removal and in one operation, it "cleans" the film image. It is uniquely adjustable for all film types and formats, from 16mm to S35mm, black and white to colour, and from original camera negative through intermediate to print and reversal material.

Oliver will benefit many types of film transfer - from those done for high-end commercial post production, to low budget film masters and restoration projects.

- Reducing the effect of dust contamination
- Reducing the time taken in de-spotting
- Reducing the visibility of artefacts and splice marks
- Improving the quality of transfers – even where the film has suffered horrendous surface damage – to match cleanliness of Top Hollywood transfers
- Real time operation

In today's moves towards Data and Film to Film via Digital Intermediates, Oliver can provide a scrupulously clean digital master, either for transfer back to film or for D Cinema projection.

In conjunction with Cintel's C-Reality or DSX products, Oliver provides "better" than film quality output as totally clean images at 4096 x 3112 pixels.

With the advent of Oliver the quality of film transfers will be changed forever. No longer will those disturbing little artefacts be pointed at by the video pundits, claiming that film images cannot be as clean as video.

The only question that remains is how could any future film transfers be performed successfully and efficiently without an Oliver system?

Comparison - Overview

Scratch & Dust removal systems

Feature	Cintel Oliver	Wet Gates	Diffuse Light Source
Deep Scratch Removal	Yes	Yes	No
Medium Scratch Removal	Yes	Yes	No
Cinch mark removal	Yes	Yes	Some
Scratch through dye layer	Some	No	No
Heavy Dust removal	Yes	No	No
Light dust removal	Yes	No	Some
Solid dust removal	Some	No	No
Grease mark removal, fingerprints	Yes	No	No
Splice hiding	Yes	Minimum	No
Use of existing gates	Yes	No	Yes
Environmentally friendly	Yes	No	Yes
Fit & forget	Yes	No	Yes
Running cost	None	Yes	Minor, extra lamp power
Format independent	Yes	No	Yes
All normal operations retained	Yes	No	Yes
Image quality maintained	Yes	Yes	No, Some resolution loss
Grain reduction	TBD	No	Some
Suitable for all film, type & quality	Yes	No	Yes

C-Reality, DSX and Oliver are products of Cintel International Ltd