STRAND FILTERS
FILTER MATERIAL USED FOR TELEVISION

Filter materials used for Television fall generally into two categories. They could be informally known as Filters for Lighting Design and Filters for Lighting Control. There are links between the two categories and, of course, some overlap on their use.

Perhaps the most important link is that of safety. All filter material used for Television (and, I suspect, for professional theatre) must conform to the appropriate British Standard (BS 3944: 1965) for flame retardent properties and subsequent behaviour under excessive temperature conditions. It is also extremely important that the stability of colour or filter effect is maintained over a wide range of operational situations.

Filters for lighting design, the category containing the whole colour range – reflective, diffusion and textured material – are probably most easily understood by the layman. The selection of these is determined by a combination of the following.

First, though not necessarily in any order of priority, the personal choice of the Lighting 'Person' (actual titles vary throughout Television!). Second, integration with other design considerations namely, set, costume and make-up and, thirdly, specific programme requirements.

This category, because it is based on intangibles and subjective judgements may be discussed very briefly or in depth for ever! consequently, for the sake of brevity, I have chosen the former.

Filters for lighting control require detailed selection against a broad technical understanding of the potential problems to be solved. For ease of explanation, typical requirements are described separately, however, it is important to understand that final selection will be based on different combinations of any or all of the following types and that situations – especially on location – can change rapidly.

a. Control of overall light level.
b. Control of relative light levels.
c. Control of light source colour temperature.
d. Control of quality of light source.
e. Control of reflected light.

a. A neutral density filter may be used to control the level of light entering the camera. As its name suggests, it affects coloured light transmission uniformly. Other means of control of final exposure namely lens iris opening, selection of film stock emulsion speed for film cameras, and setting of electronic gain for video cameras, and exposure time, may introduce undesirable or inconvenient factors. For practical reasons the filter would usually be fitted to the camera but could be associated with the light source illuminating the scene.
b. In spite of the march of technology the Television medium is still limited in its handling of contrast, and though constantly improving, control of relative lighting levels in the original scene is essential for good results. In this respect film cameras are considerably 'better natured' than current types of video cameras. To achieve the required limitation of this contrast a small number of practical options are available. Incandescent sources may be supplied via dimmers although then there may be colour temperature variations to be considered. With discharge sources normal dimming as used with incandescent sources is not yet practicable, consequently use of neutral density filter is the commonest method of reducing light output although some use is made of variable shutter devices. Sources over which we have no control, the most obvious being daylight, filtering either by N.D. material or by perforated types is a common method.
c. With the advent of colour in television, an added complication was the often undesirable effects of mixed colour temperature sources. Although it took some time to assess the range of acceptable differences, it is necessary to limit these differences usually by careful initial selection of sources and then by filtering. It is interesting to note that what was considered to be a problem at the outset is now used quite specifically as part of the lighting person's armoury!

Here the video camera has some advantages. In the film camera the colour response is governed by the selection of the appropriate film emulsion specification though, of course, this can be modified during 'grading' and processing. In the video camera the colour response can be adjusted over a fairly wide range at will either manually or automatically giving rise to the need to constantly 'White Balance' if light conditions vary. The process of 'White Balance' adjusts the proportions of red, green and blue by allowing electronic gain. Frequent use of light sources of different colour temperatures is unavoidable particularly on location. The most common example encountered is the mixture of incandescent and daylight or HMI, CSI, CID types. Usually the initial approach is to endeavour to match the minority source to the majority source for reasons of time, cost and effort. However, it is rarely that simple for a number of reasons. Here are just some of them!

Any form of filtering introduces losses, and losses of output may not be acceptable. As a 'full correction' of incandescent to daylight for example equates with 1 F Stop, in effect half of your available light is lost! To increase the initial light level to allow for that loss may not be practical because of limitations in power supply or it may not be possible structurally to install that amount of equipment, or there may not be enough time available to install that amount of equipment. Perfect matching of correction filters to sources with very uneven colour output is extremely difficult and in practice with multiple sources is at best a compromise. Because of their uneven colour rendering discharge sources even when 'corrected' may have unacceptable or unflattering effects on some artistes' complexions and some architectural surfaces, particularly some types of stonework and woodwork. Often a practical compromise involves partial correction of one source and partial correction of another, for example, half correction on a window and half correction on the artificial light source. It is vital to understand that it is the overall resultant colour temperature that has to be within the acceptable range for the camera.
d. The quality of light used for Television is an extremely important factor. In this context 'quality' is defined by its relative 'softness' or 'hardness', usually assessed by characteristics of shadows cast, diffusion type filter may be used to soften hard light sources, this process being extended by using even larger areas of filter material illuminated by a choice of sources, since 'softness' is achieved by increasing the area of the source relative to the subject being illuminated.
e. Polarising filter is often used to reduce undesirable reflections from windows and car windscreens for instance. It is also possible under some circumstances to obtain a variable neutral density effect on, say, a window by applying polarising filter to the window and also to the camera and adjusting the relationship of the filters by revolving the camera filter thereby altering its relationship to the window filter. There are, unfortunately, some operational limitations imposed by this method, not the least being the loss of 2-2 1/2 stops minimum!

It may be of interest to note that development of the solid state digital video camera may eventually render filter for lighting control redundant!

To conclude, and in the meantime some thoughts perhaps for filter manufacturer's 'back room boys'. An ideal specification for correction filters would contain the following.

1. Wide variable range of density – controlled electronically and therefore possibly remotely.
2. Wide variable range of colour, colour correction controlled electronically and therefore possibly remotely.
3. Wide range of sizes available.
4. Instantly changeable from flexible to rigid and matt or glossy surface.
5. Inexpensive!
6. Practitioners should *not* hold their breath.

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