

# Survey Results Regarding Lenses Used in Film and Television

## The Current Situation

Lenses are some of the most important tools used to create a “look” in a film. It stands to reason that lens manufacturers are working to perfect lenses by eliminating optical artefacts and maximizing sharpness etc.

But which lenses would the USERS, the camera people, really want to work with? What are their priorities and needs?

In the era of digital cameras, the choice of film stock or photo-chemical processes which could be used to influence the look of a picture while recording, have vanished. On the other hand, digital colour grading has become more and more important – a part of the production chain that often cannot, or not completely, be influenced by the DOP.

Has the lens therefore become one of the last possibilities to create a photographic look?

The next big changes in film technology are irreversibly on their way – the development towards even more picture quality with 4K/8K or UHD. What are the consequences for the development of new lenses?

## Target

In May 2014, The Center of Advanced Studies of Film and Television Technology – a scientific institute of the HFF Munich – wanted to answer this question together with the community of lens-users in order to start a dialog between designers of images and lens developers.

## Method

Prof. Dr.-Ing. Peter C. Slansky, Director of the Technical Department of the Munich University of Television and Film (HFF) as well as Director of The Center of Advanced Studies of Film and Television Technology developed a questionnaire. Katrin Richthofer, Manager of The Center of Advanced Studies of Film and Television Technology, developed a survey in German and English and carried out its statistical evaluation, assisted by Claudia Stoll. They used the software *Umfrageonline*.

The survey addressed all camera people who were responsible for the camerawork in cinema or TV-productions, as their main profession, in the years 2012/2013/2014. The German version of the survey was online from June 26<sup>th</sup> to August 29<sup>th</sup> 2014, the English version from July 7<sup>th</sup> to August 29<sup>th</sup> 2014.

The questions differentiated between the specific usage of lenses for TV or cinema productions as well as different ways to create images. It also took into account that different projects have different optical requirements.

The exact structure and all the questions are in the detailed report that is published on the SFT Homepage [www.filmtechnologie.de](http://www.filmtechnologie.de).

The questionnaire also contained a glossary with optical technical terms.

## Participation

Worldwide, a total of 442 camera people took valid part in the survey, 171 in the German and 271 in the English version. 51 % of all participants were members of a camera association of professionals.

## Productions and Formats

In the production years 2012/13/14 the interviewees named as their chief employment:

- fictional cinematic films including TV co-productions: 26 %
- documentary cinematic film including TV co-productions: 11 %
- cinematic or TV commercial: 21 %
- fictional TV Film/ TV series: 16 %
- Documentary TV formats (Features, Documentaries, Reports): 21 %
- TV studio productions and external mobile recording (E-Camera-production via control desk): 5 %.

In comparison, significantly more English-speaking camera people working in the area of cinematic production and cinematic advertisement answered the survey. With the German version, we reached more camera people working in the field of documentary TV formats and TV studio productions and outside broadcasts.

The significantly higher number of camera people with a focus on the first four categories is easily understandable, due to the topic of the survey.

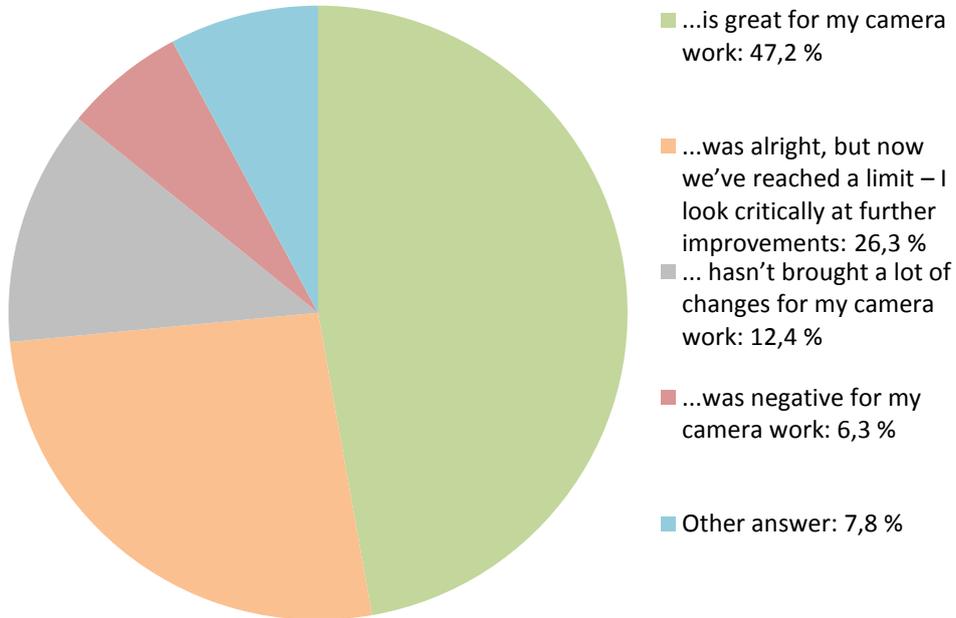
In the years 2012-14, the participants used the following types of cameras:

- 35mm film: 7 %
- 16mm film: 5 %
- Digital One-Sensor-Camera; S 35 Sensor or similar: 68 %
- Three-CCD-Video camera; 2/3" Sensor or smaller: 20 %

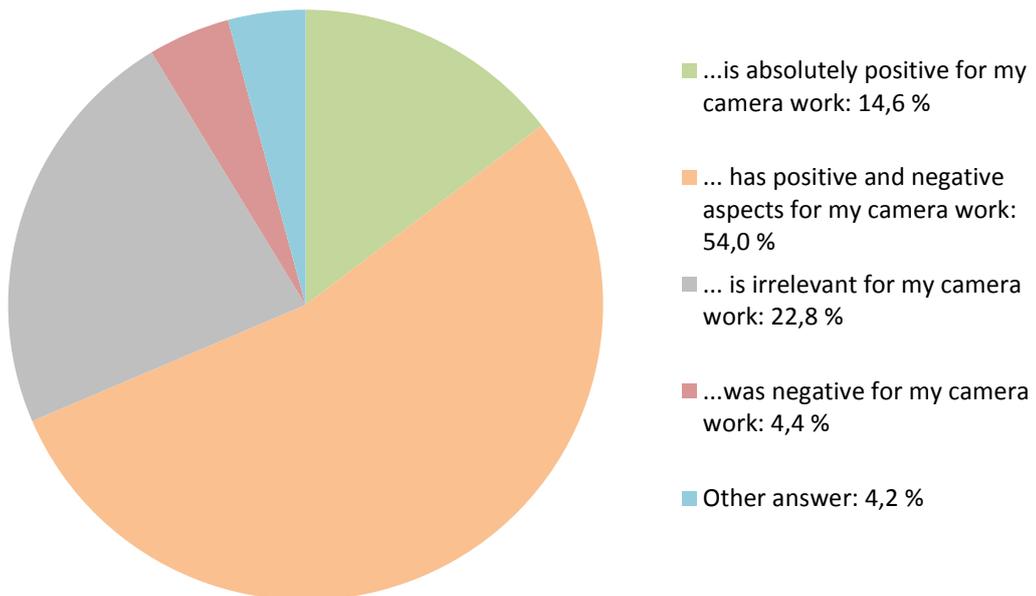
This distribution manifests the central importance of the results of this survey.

### General results

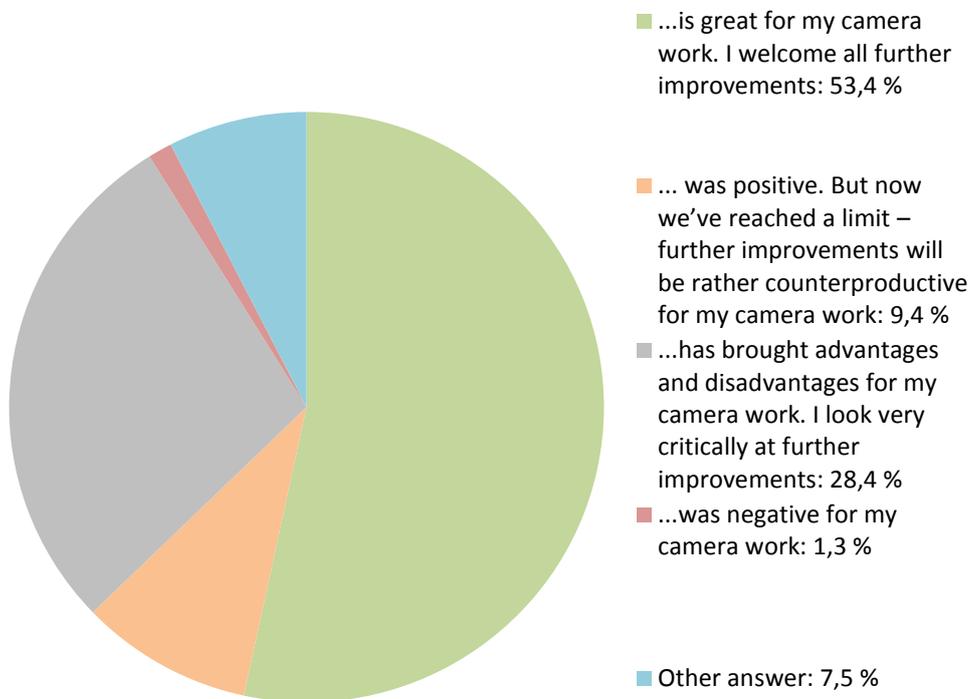
“The improvement of picture quality in TV from Standard Definition to High Definition or in Cinema to Digital projection in 2K/4K ...” is generally rated as positive:



It's interesting that the English answers were significantly more positive than the German answers. Further improvements of the picture quality of film and TV are rated much more critically. The introduction of Ultra High Definition and 4K/8K ... was rated as follows:

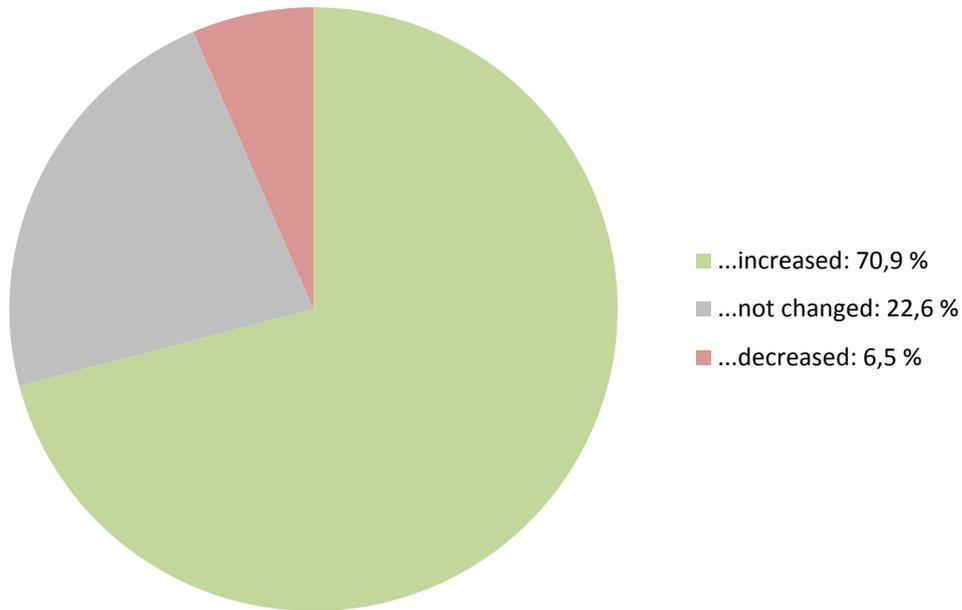


In contrast “the technical improvements of camera lenses over the last ten years” are rated much more positively:



The answers to this question manifest the central thesis that – with the emergence of digital cameras, post production, color-grading, cinema projection and High Definition flat screens -the importance of the choice of a certain model of lens has increased:

“With the technological improvements of the last ten years the importance of the camera lens for the design of the look has...



The overall acceptance is even greater in the German-language survey.

### Specific results

In the optical part, we asked about the importance of different optical quality parameters for personal creative work. As was expected, there were high overall ratings, therefore the differences were sometimes rather minute. Many of the interviewees pointed out that the importance of many of the criteria depended on the individual projects and intended look.

#### Acuity

Many of the free text answers pointed out that from a certain point, too much detail resolution decreases the possibilities of image composition and the viewing experience, since fine details draw attention from the central issue – the story.

#### Optical pumping when focusing

Concerning acuity of lenses, as was expected, the criteria “detail resolution“ and “detail contrast“ were generally rated as very important. Even more important – and here, interestingly, everybody agreed – is a consistency of the framing when pulling focus. This is a demand typical to film as opposed to still photography. Therefore, still photography lenses can’t be used indiscriminately.

#### Shape of the defocus figure

As to the bokeh of lenses, two thirds of all participants voted for different shapes of the defocus transition to create different looks.

Still, around a fifth preferred the harmonious bokeh of a perfectly round iris aperture. A nonagonal bokeh is rated as second best, lesser numbers of focus blades reproducing a defocus figure of this shape are rated successively worse, a rectangular or even triangular shape is rejected.

### **Lens Flares**

If a light source shines directly into the lens (e.g. the sun), there are light spots along the optical axis due to internal reflections on the surface of the lenses, so-called “lens flares“. Due to different coatings on the lenses, those lens flares can have different colors. Leaving aside the question of look and whether lens flares should be avoided at all, neutral white lens flares are generally preferred. Lens flare colors on the scale red-orange-yellow to bluish are also acceptable, whereas lens flares on the color scale green to purple are mostly rated negatively.

### **Distortion**

For the parameter “optical distortions” a lot of free text responses pointed out that there is a contradiction, especially for wide angle lenses: If the lens is optimized for exact planarity, a two dimensional test chart will be rectangular and parallel, whereas in a scene, a round object at the edges of the frame – a head for example – will be distorted. Therefore, for scenic use, wide angle lenses with a “mild harmonic” barrel distortion are preferred. A perfectly plane lens is only preferred for shots with, for example, architecture as the main image content.

### **Color reproduction**

An important result is, that a visually pleasing rendition of skin tones is rated as the most important parameter of all, more important than the overall color reproduction.

### **Balance behavior**

Constant optical parameters for all lenses of a set of fixed focal length lenses are rated as very important. This refers to their optical reproduction characteristics as well as to measurements, weight and handling.

The same applies –even more importantly – to constant optical parameters within the focal lengths of a zoom. Zoom objectives used in still photography which changed their length and centre of gravity when zooming were rated critically.

### **Use of old lenses**

A majority of the participants stated having used old lenses. Old lenses are not used because they are economical, but instead to record a special look while filming. A lot of the participants agreed that earlier, lenses had to reproduce reality as accurately as possible, whereas today, they should give the image “character” which has been lost.

### **Anamorphic lenses for the format 2.37:1**

The question about the format 2.37:1 evokes an interesting divergence between the German- and English-speaking participants: Whereas only 40 % of the German-speaking group used this format, 55 % of the English-speaking participants did. This can be partially explained by the higher rate of cine- and commercial productions. Overall, 79 % of the 2.37:1 productions were shot with spherical lenses and 21 % with anamorphic lenses. The participants blamed this distribution as necessary due to budget or workflow reasons, however lots of them wished to shoot with anamorphic lenses more often due to creative reasons.

### **Wishes of camera people to the lens manufacturers**

In several free text fields, the participants could express their wishes to lens manufacturers. From the vast variety of answers, some trends are evident.

#### **Variety of lenses**

There's a strong wish among the creative designers of images for a variety of lenses with differing imaging properties to create different looks. This includes new constructions as well as old lenses. Only a minority wished for the "perfect lens", a majority emphasized that for them the choice of a certain model of lens is an important design element.

#### **Compact ENG-type zooms**

Many participants wished for a compact, light zoom lens for S-35 in the medium zoom range. The existing range is seen as too limited. Frequently, an ENG typical design with integrated handgrip was requested, for documentary work with one sensor cameras.

#### **Integrated Gray Filters**

A lot of the participants stressed the fact that – with the higher sensitivity of cameras of usually more than 800 ISO – a lot of recording situations require the use of ND-Filters. This should be taken into account by the lens and/or camera manufacturers (here the wishes were divergent) and be integrated in the construction design, instead of frequently having to use big front lens filters. The latter is regarded as critical for the color reproduction, as well as the handling of the camera.

#### **Budget anamorphic lenses**

As mentioned above, a lot of camera people wish to use anamorphic lenses more often for wide screen formats. In the past this often failed due to budget reasons.

#### **Better communication**

A lot of the participants judged the survey as an important step towards better communication between image designers and lens manufacturers. A lot of the free text

answers lamented the fact that there is a big barrier in between the two worlds which has to be broken down in order to sustain the truly desired lens products.

The Center of Studies of Film Technology at the HFF is pleased to continue supporting the attainment of this goal.

### **Perspective**

The full evaluation of the survey was presented at the Annual Meeting of the European Optical Society on September 19<sup>th</sup> in Berlin and at the Cinec in Munich, September 20<sup>th</sup>, 2014.

The report can be downloaded from the website of The Center of Studies of Film Technology (SFT), [www.filmtechnologie.de](http://www.filmtechnologie.de).

In March 2015, the SFT will organize a Lens Workshop at the Munich University of Television and Film (HFF). [www.filmtechnologie.de](http://www.filmtechnologie.de) or [sft@hff-muc.de](mailto:sft@hff-muc.de).

Peter C. Slansky, Sept. 5<sup>th</sup>, 2014