What should I be looking for in a grow light reflector?

Reflectors in lighting fixtures perform 2 major functions, redirecting light downward from behind and aside the lamp, and distributing the light intensity downward in the desired footprint pattern and evenness. A third, but lesser function is helping with heat dissipation. While it is well understood that a good reflector design is important it is not always apparent that all manufacturers put out the proper effort or that end users choose properly for their application.

Redirecting Light
Redirecting light back toward the crop is the most obvious and basic function of a reflector. With the exception of LED units all lamp technologies emit light in all direction. Even if 120 degree beam pattern were desirable then about 2/3 of the emitted light is going the wrong direction and needs to be redirected toward the desired area of illumination. In this respect the most important factor is getting as much of the light as possible redirected forward with as few reflector bounces as possible. The main trick is to avoid getting light trapped deep behind the lamp and reflecting light back toward the lamp.

Distributing Light over the Footprint
A good reflector design will ultimately result in a specific footprint shape with as much evenness of intensity as possible. This is the more difficult task requiring real engineering and ingenuity and the final result will never be ideal, but only as good as the designer. Lamps tend to project oval or round footprints, but the most practical use is to have a rectangular or square footprint. The challenge is to redistribute light to fill in these corners. For grow applications this is a unique challenge since the requirement for a relatively even intensity distribution is not very critical for most other lighting applications.

Specular vs. Diffusive Reflectors
This seems to be a topic for some discussion, but there is no clear answer as to whether one is superior to the other. The real issue is most likely to use the style that best suits the particular application and need. This may actually result in a mixing of the two styles. Diffusive will likely result in additional reflections and greater reflective losses. If the light is buried behind the lamp then diffusive may be the best bet to recover some of the light, but at that point perhaps a repositioning of the lamp may be justified. Diffusive can also help even out the distribution of light over the desired footprint. Generally when light can be easily reflected in a desirable direction then specular likely makes the most since and will be the most efficient since the reflections will be more direct.

No Effort Designs
When looking at a reflector it is pretty easy to pick out the units for which no real effort is made in the design. These manufacturers are just attempting to reflect the back and side light with no effort to aim it in any particular direction. Often they do not even do the best job of recovering as much of this light as they could. Reflectors that simply follow the straight angular contours of the hood are an obvious sign of this. Some hoods are just painted with a highly reflected paint.

There are some hoods which themselves are shape as a good reflector design so they would not be included in this group. If by appearance it is obvious that little to no effort was put into the design that is likely the case. The images below shows how two different manufacturers approach reflector designs. The fixture on the left is manufactured by Inda-Gro Induction lighting (MSRP $795.00) weighs in @ 14lbs and uses a separate specular reflector material from the housing. This reflector is both highly reflective and specifically fabricated with geometry to maximize redirection of the photons that would be lost from the rear of the lamp and from between the opposing tubes back towards the canopy.

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The fixture on the right is manufactured by the iGrow company (MSRP $1,200.00) weighs in @ 38lbs and utilizes the hood as a diffusive reflector. This is an inexpensive and unimaginitive use of the lamp technology as the reflective surfaces are not highly reflective and are too far away from the lamp which is lost energy as it meets that surface and is redirected. The other issue you'll note with the reflective characteristics of the iGrow light is that the interior ends are not angled to project light downwards. They are simply flat edges at right angles to the lamp surface. Consequently the Inda-Gro will emit light intensity 20-30% higher than the iGrow over a 4 x 4 area with their reflector material and design over painted metal surfaces that lack the geometric properties necessary to optimize area coverage.

Summary Conclusions

If one were to compare two identical lamp sources with different reflectors to see the differences in crop performance, the reflector that utilized high quality refelective material and intelligent reflector design based around that specific lamp characteristics will result in heightened crop performance values.