

**One Reason Why Images  
reproduced with  
CRPCs 1-7 may have a (Common)  
Similar Visual Appearance**

David McDowell



# From Clause 4.1 of DR 8-13, Draft No. 5

“As can be seen from the result, these reproductions differ in both colour contrast and saturation due to the differences in colour gamut but there appears to be some colour consistency through the set. It is this colour consistency that we have called Common Colour Appearance and wish to explore further.

“



# Common Characteristics of CRPC 1 to 7

- Hue angle of the inks are common
- All based on a common gray scale definition
  - Fixed set of CMY triplets
  - Substrate corrected  $a^*$   $b^*$  values
- Neutral scale follows CGATS TR 015 tone reproduction aims



# NPD vs Tone Value

- NPD (neutral print density) is the substrate relative colorimetric Y density which is approximately equal to the substrate relative ISO 5 visual status density
- NPD is used to evaluate the tone reproduction of the CMY neutral scale
- CGATS TR 015 specifies the aim NPD of the CMY neutral scale as a function of the input cyan tone value and the  $L^*$  of the 3-colour solid.

# Why Cyan Tone Value is used as the Reference

- Cyan is used as the reference because the M and Y triplet values are defined as a function of the C value according to:

$$M = Y = 0.7470C - 4.100 \times 10^{-4} C^2 + 2.940 \times 10^{-5} C^3$$

- The Cyan tone value is therefore a measure of the tone values used to create the neutral scale.

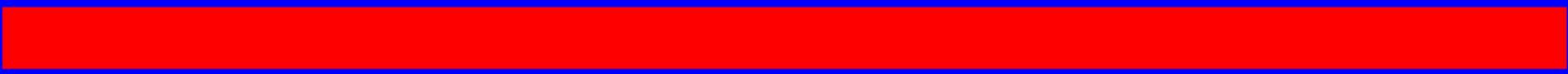
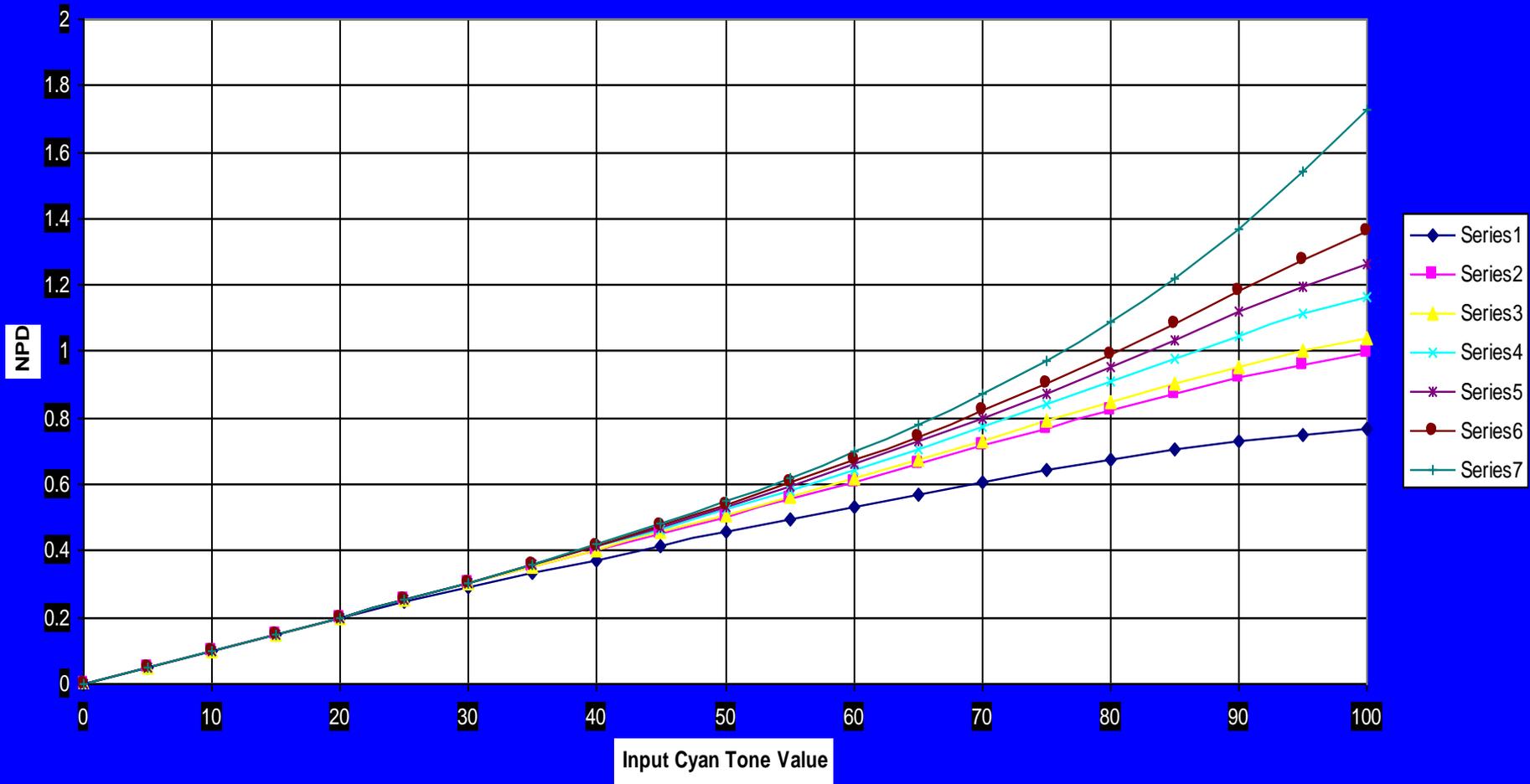


# Tone Reproduction Curves of CRPC 1 - 7

- The following figure shows the Aim NPD of CRPCs 1 to 7 vs cyan input tone value
- Note that up through an input tone value of about 50% the Aim NPDs are virtually identical



NPD vs Input Cyan Tone Value

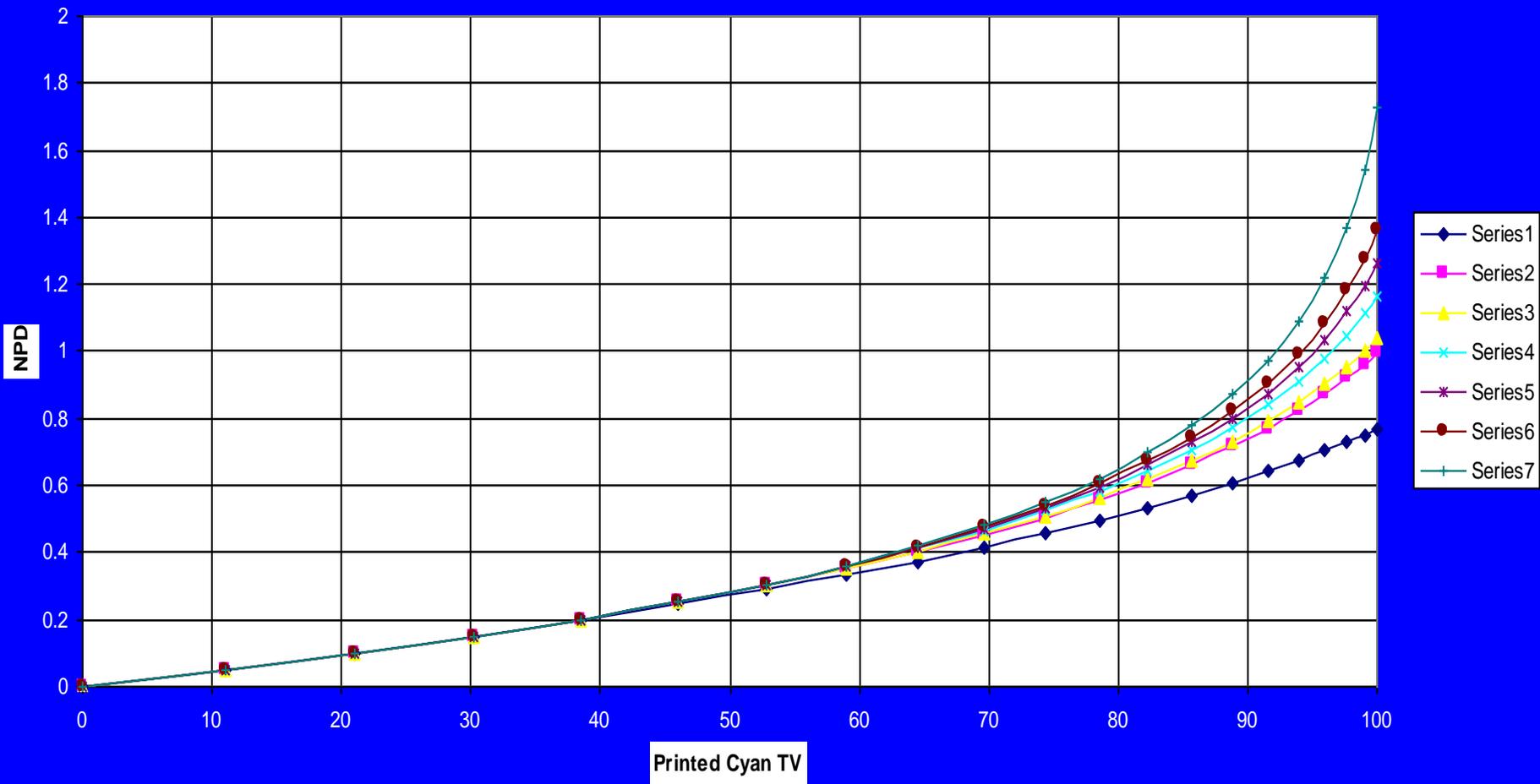


# Tone Reproduction Curves of CRPC 1 - 7

- However, the input tone values are not what we see.
- The following figure shows the Aim NPD of CRPCs 1 to 7 vs the cyan PRINTED tone value (the specified TVI is added to the input tone value).
- Note that now up through a printed tone value of about 70 to 75% the Aim NPDs are virtually identical.
- Remember that an NPD of 0.3 is 50% reflectance.



NPD vs Printed Cyan TV



# An Observation

- For many images, when we look at reproductions of the same image on different materials (with different gamuts) the average “weight” of the image and the highlight reproduction has a large influence on our judgment.
- If the gray balance is the same and the highlight color scale is the same, that also influences us to judge them as similar.
- As shown earlier, the CRPC 1-7 family of characterization data is such that images prepared for any one of the data sets and reproduced using a different data set will usually be judged to meet the criteria of having a common (similar) colour appearance.

