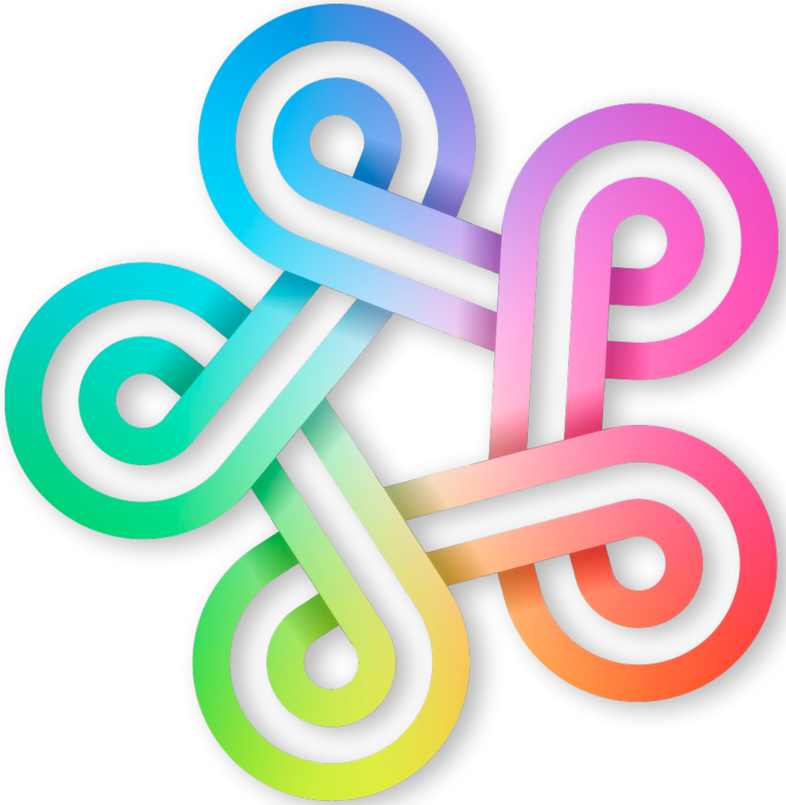


COLOR CONFORMANCE CONFERENCE ‘25

New Port Richey, FL (Tampa North)
January 28–30, 2025

COLOR CONFORMANCE
CONFERENCE ‘25

Your Hosts- Welcome!!!

COLOR CONFORMANCE
CONFERENCE ‘25

Where are You in your Color Control Journey?

January 28, 2025

Presented by

David Hunter

Agenda

Reality of Color Quality Communications Today

What is Manufacturing?

- Process Control vs. Color Conformance

Moving from Subjective to Scientifically based Communications

- Quantifying color expectations
- Linking color expectations to print capabilities

Productivity and Profitability

- Starts at the Operator – Know when producing waste
- Reporting efficiency and effectiveness in print process

Conclusion

When Dealing with Customers...

Reality of Print Approvals- Salable Print

- Proofing “Match”
- G7 Compliant
- ISO Standards
- Score Carding

Let’s take a closer look at the reality of each...

Reality of Print Approvals

Approve – How to quantify acceptance?

- No easy way to quantify match
- Subjective
- Visual eye balling

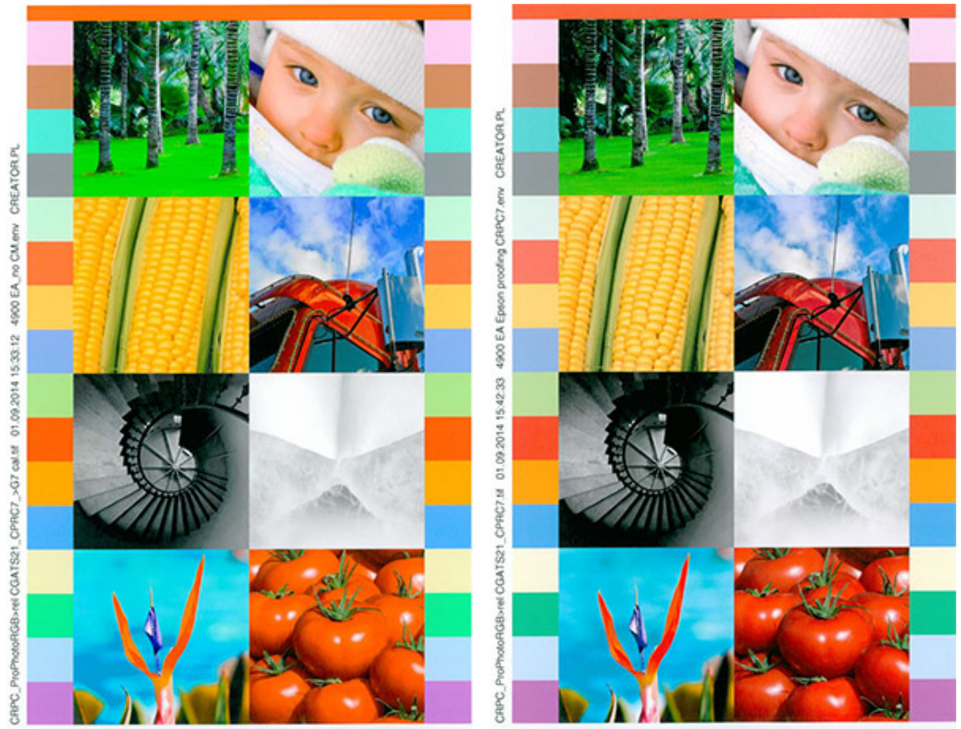
Doesn't ensure color quality nor consistency

Reality of G7

G7 is a methodology delivering shared common appearance

- G7 never promised color “match”
- G7 Methodology based Gray Balance & NPDC, process control **not Color**
- G7 doesn’t quantify a color match…

Doesn’t ensure color quality



Reality of ISO Standards

Formulas that describe a way of printing…

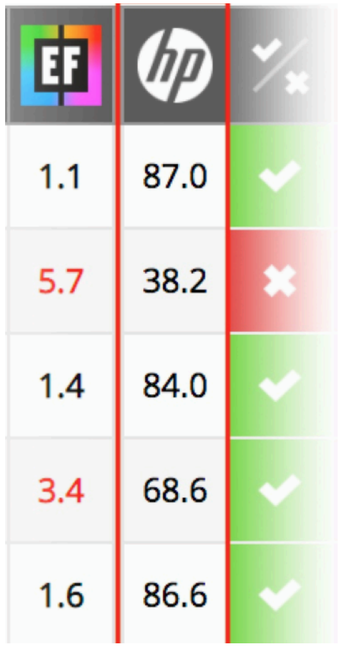
- ISO 12647-2 to 6 Printing Standards
- ISO 12647-7 Proofing Standards – process control tolerances
- ISO 15339 Printing Standards (based on G7), no tolerances

No Ability to audit ISO print standards in North America

Reality of Score Carding

Process Score Cards don’t predict color match

- 5 points for each primary within 3 ΔE etc… process control
- 85 points – Good Match? Can’t relate to customer expectations
- **Can’t compare printers to one another:** only to reference



Doesn’t ensure color quality

Process Control vs Color Conformance

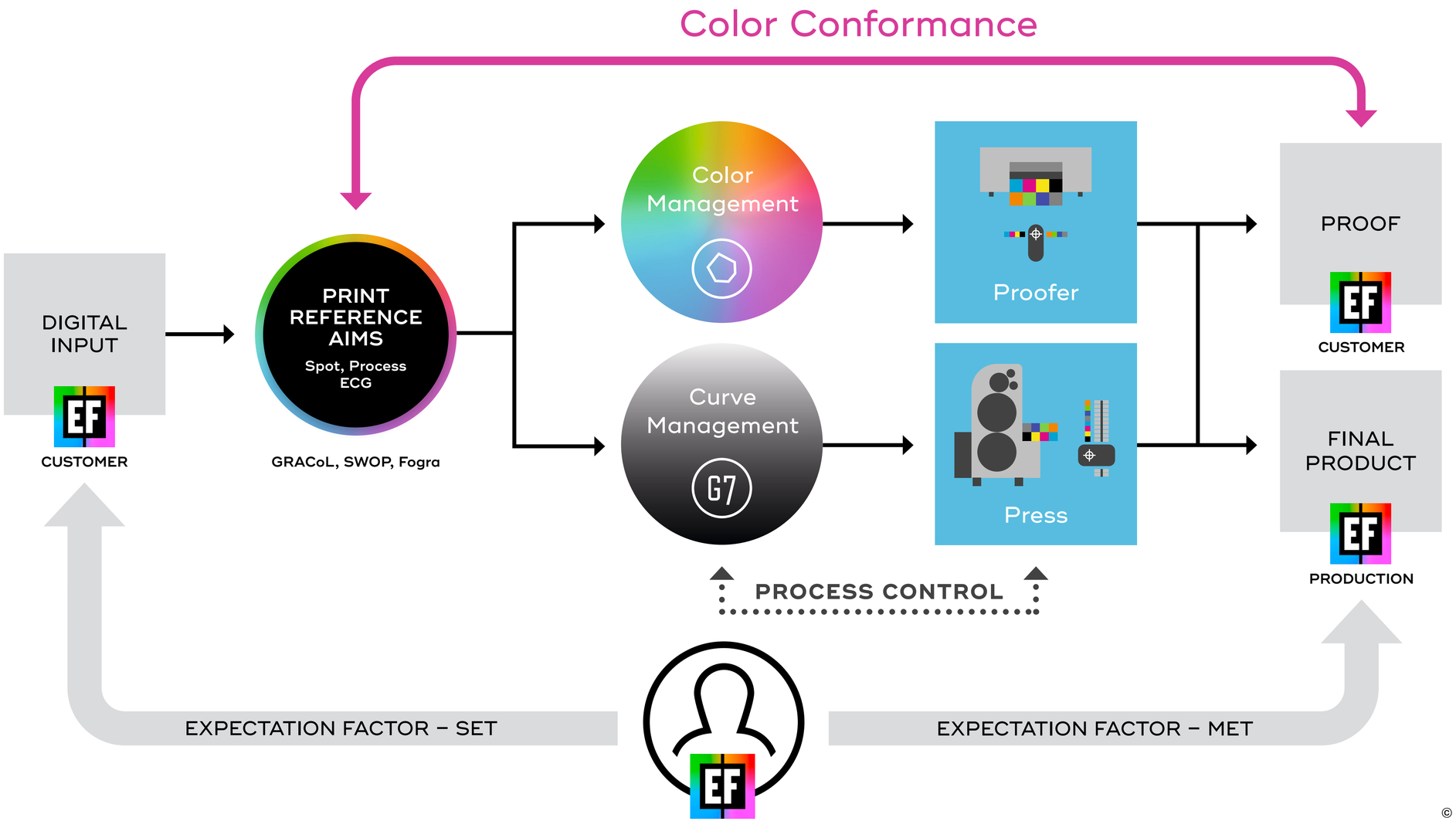
What is Manufacturing

- Taking raw materials and creating products that consistently meet customer **expectations**

- **Process Control**: Ensuring a process is predictable, stable and consistently operates at a target level of performance, with only normal variation
  - Proofing, ISO Standards, Score Cards, G7 methodology

- **Color Conformance**: Manufacturing quality color means meeting a customers color requirements/**expectations**, producing salable goods
  - Introducing: E-Factor metric
  - Depends on Process Control, better the process control, better the E-Factor

Manufacturing – products meeting Customer expectations



Where is Your Company At?

GRAPHIC ARTS — PRINT MANUFACTURING

SUBJECTIVE — PERSONAL-BASED JUDGMENT — METRICAL-BASED JUDGMENT — SCIENTIFIC

VISUAL ASSESSMENT • COMPARATIVE COLOR MEASUREMENT • ADVANCED COLOR MEASUREMENT

VISUAL

Personal perception-based comparision to physical standard

- no knowledge required
- expensive and time-consuming personal supervision
- dependent on the person
- lighting conditions related
- uncontrolled metamerism
- no repeatability
- initial swatch-book inaccuracy
- instability of color samples
- different substrate / OBAs
- unpredictable issues of opacity, overprints and tints

BASIC INSTUMENTAL

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COLORIMETRIC AIM

Instrument-based comparision to colorimetric standard

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SPECTRAL AIM

Instrument-based comparision to spectral standard

- numerically expressed color differences
- stable color definition
- exchangable color definition
- lighting condition independent
- controlled metamerism
- the possibility of remote control
- trackable instrument precision and stability
- optional inter-instrument agreement harmonization

Customer Expectations – How Do You Know?

Experience – Multiple Accepted and Rejected Job

- Person at printer that looked at jobs, understand difference

Visual impression

Reference

G7 Pass

≠

Actual

G7 Pass

Objective numbers

Difference = ?

Customer Expectations – How Do You Know?

Experience – Multiple Accepted and Rejected Job

- Person at printer that looked at jobs, understand difference

Visual impression

Reference

G7 Pass

=

Actual

G7 Pass

Objective numbers

Difference = ?

Customer Expectations – How Do You Know?

Experience – Multiple Accepted and Rejected Job

- Person at printer that looked at jobs, understand difference
- Tribal Knowledge – human subjectivity – can't translate
- Results in rejected jobs – waste, loss of profitability

Visual impression

Reference

G7 Pass

≠

Actual

G7 Pass

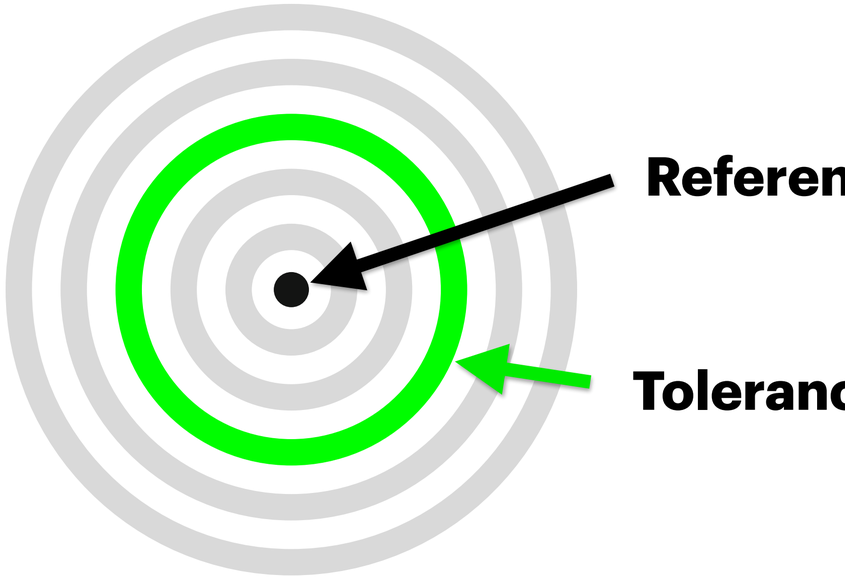
Objective numbers

Difference = ?

What If?

We Could Use One Number to assess Salability

- Assess customer's Expectations (E-Factor) with number



- If Production is manufactured inside tolerance = Salable!

What If? Color Conformance!

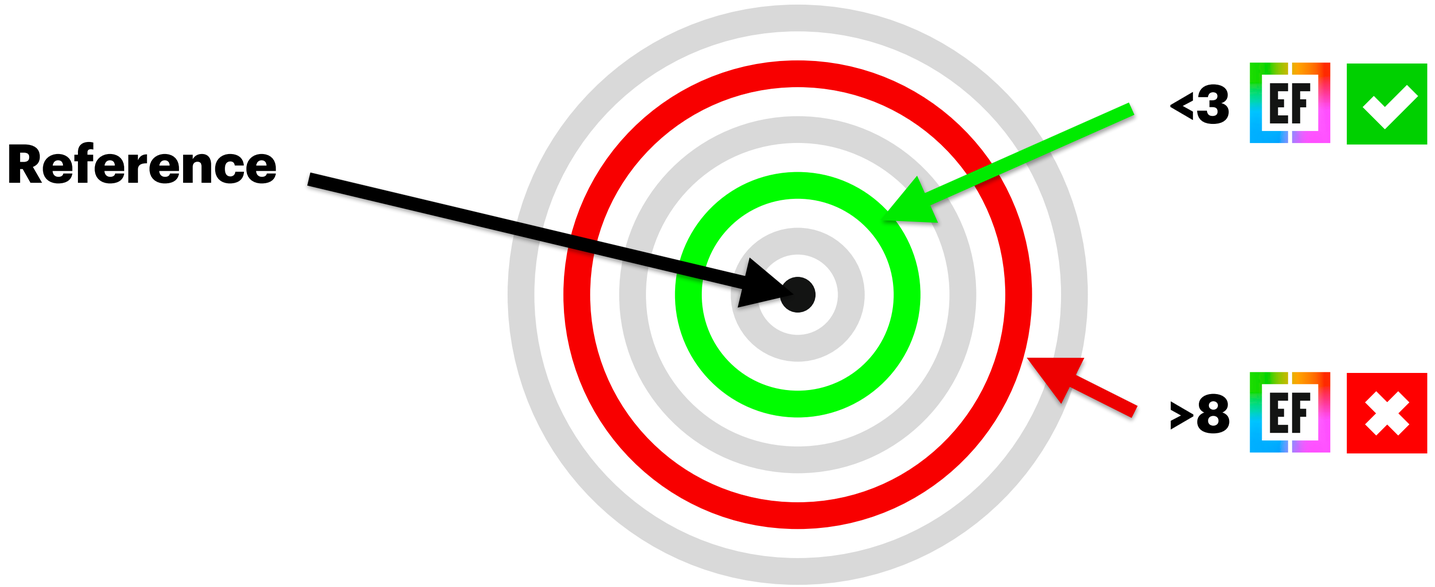
We Could Use One Number to Assess Salability

- Assess customer’s expectations with this number
- Use to compare difference between print and reference
- Use to compare any two printing conditions to each other
- One number for operators to know if salable or waste
- Different tolerances for different types of work

But if we know the Range of Acceptability…

Industry Studies – Print Buyer Expectations

- 93%+ Print Buyers will accept <3 E-Factor
- 95%+ Print Buyers won’t accept >8 E-Factor



Industry Results: Color Conformance

Industry Survey

- For first time in Industry, can use "**One**" number to determine if match is acceptable or not most of time
  - E-Factor: 1-3 = Good or Excellent Match by vast majority
  - E-Factor: 3-8 = **Danger Zone: Unacceptable to some**
  - E-Factor: 8+ = Unacceptable by vast majority

- **Danger Zone**: **most printing today**
  - Unknown if Customer will accept, cause customer rejection and need to reprint (costing time and money) killing profitability
  - Most printers today manufacture in 4-6 E-Factor = **Danger Zone**

But if we know the Range of Acceptability…

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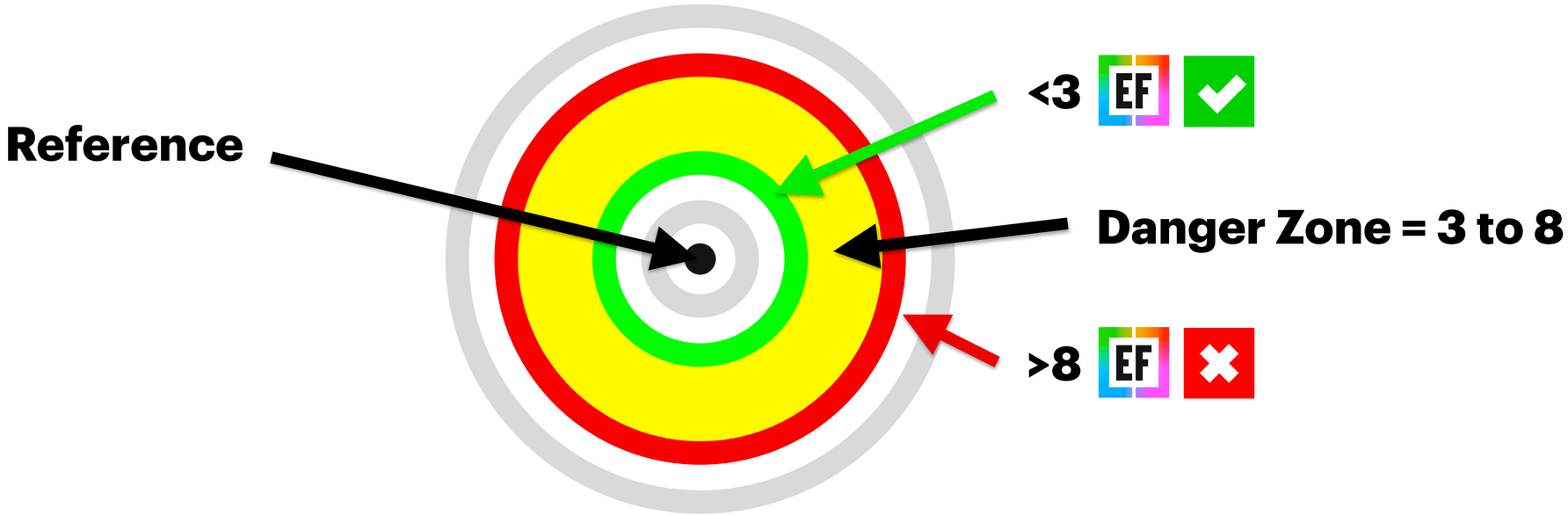
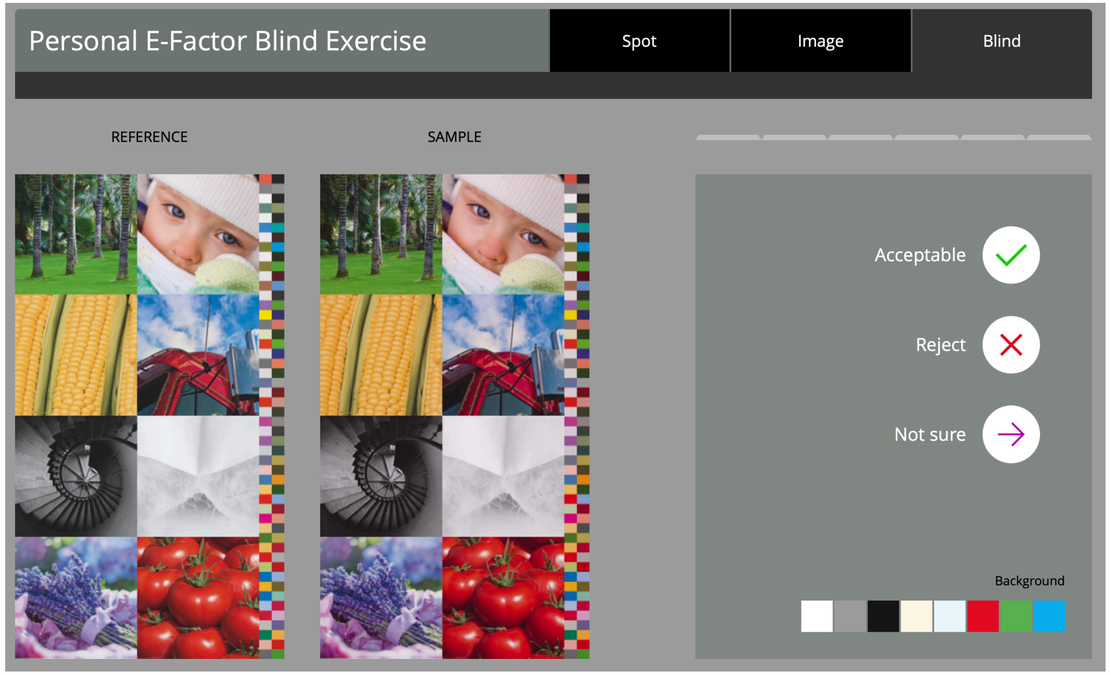
- 95%+ Print Buyers won’t accept >8 E-Factor



Determine Any Customer's Expectations

Free Web based exercise: https://chromachecker.com/cee/en/start



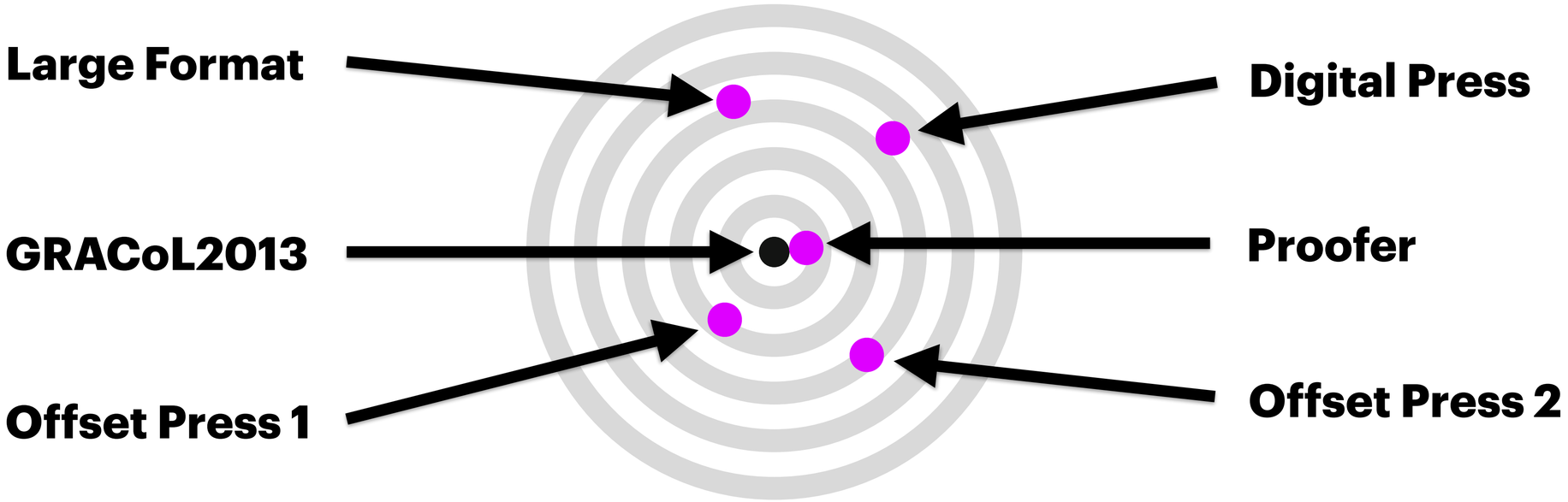
Each page is marked with one of the icons:

Printed version for $99

Determine Any Printing Device's E-Factor

Match Printers to Reference (GRACoL)

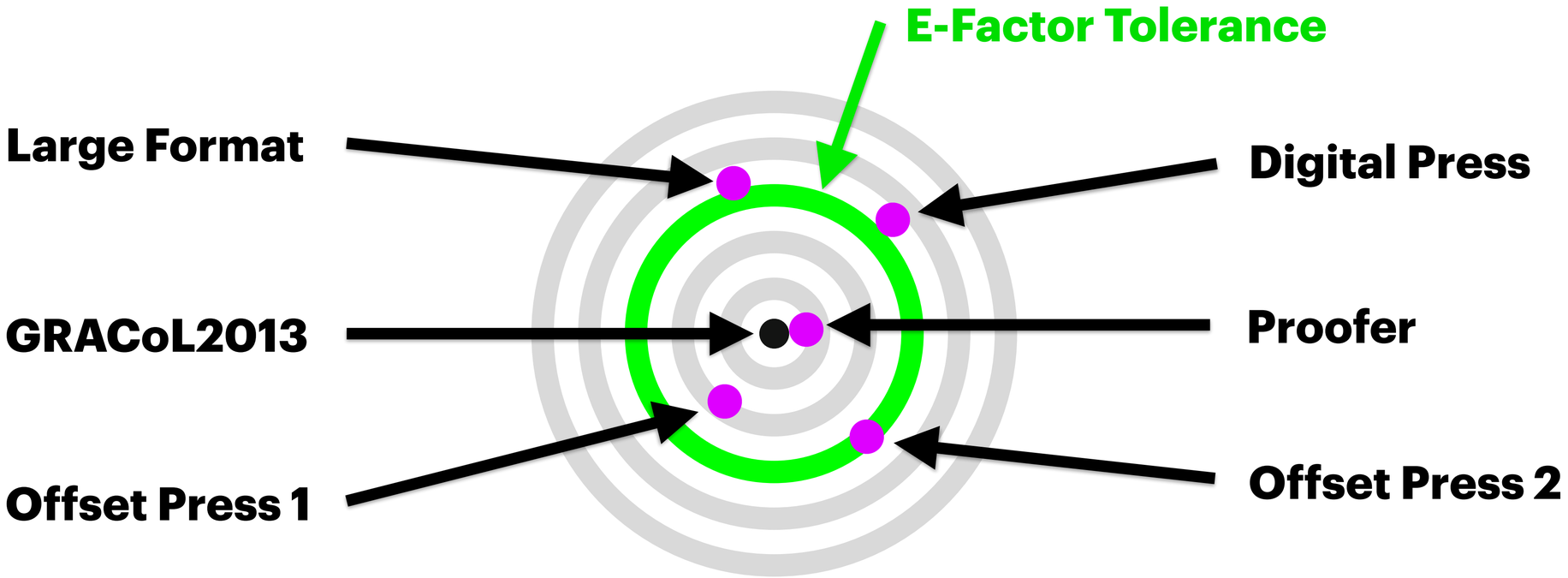
- Each printer is a dart, within E-Factor tolerance?
- Do you know how your printers perform, every shift?



Color Match – Quantify How Close?

Define Plant Tolerance

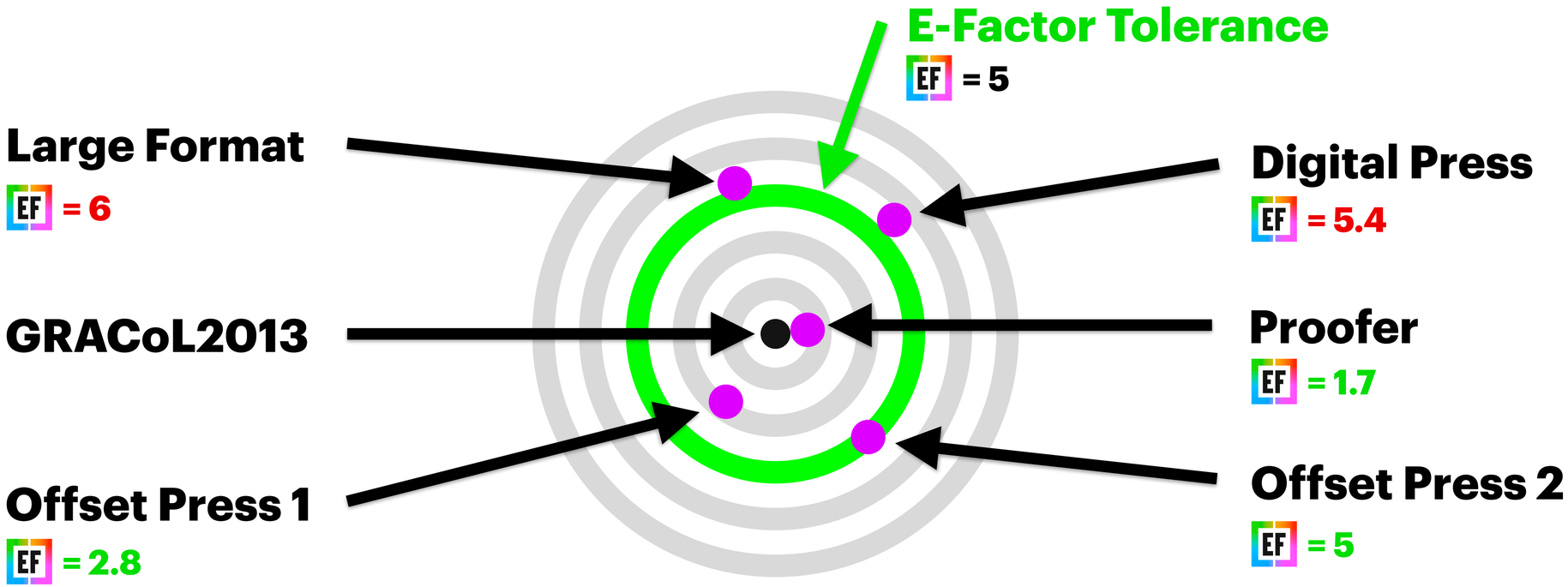
- How close Required? Not only to reference, **but to each other**



Color Match – Quantify How Close?

Define Plant Tolerance

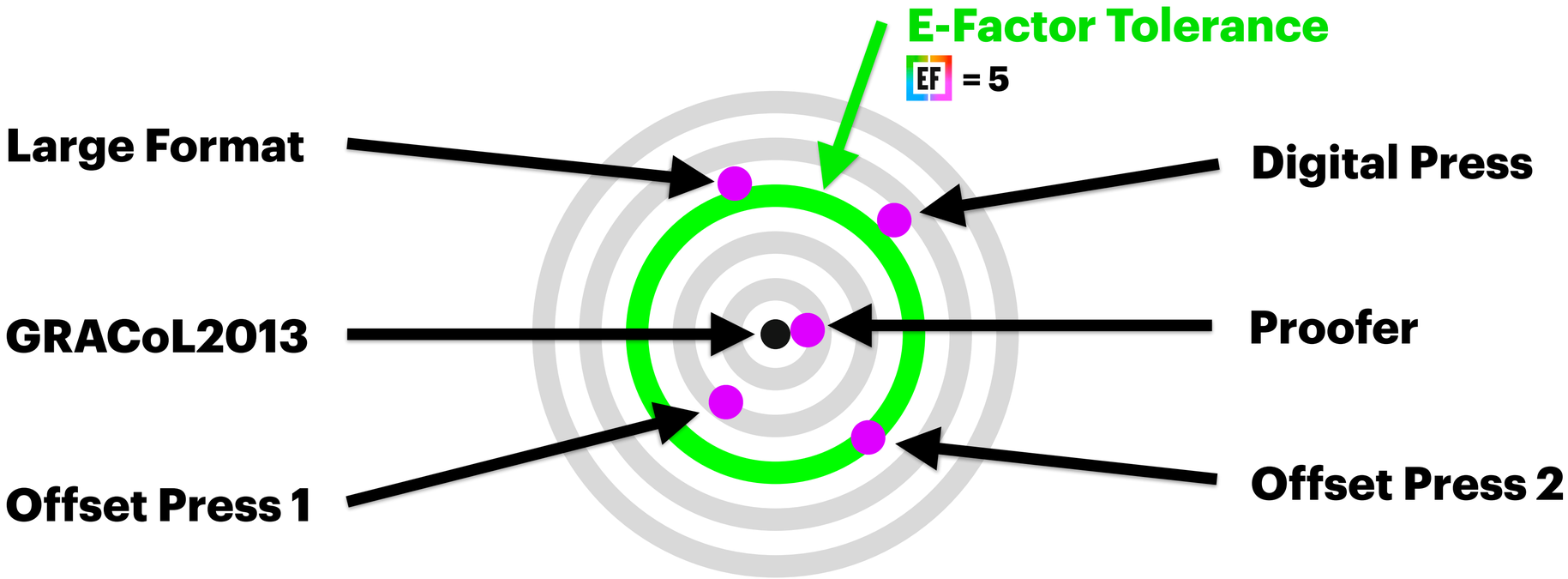
- How close is Required? E-Factor metric…



Color Match – Quantify How Close?

How Many of you know what your E-Factors are for each of your printing devices?

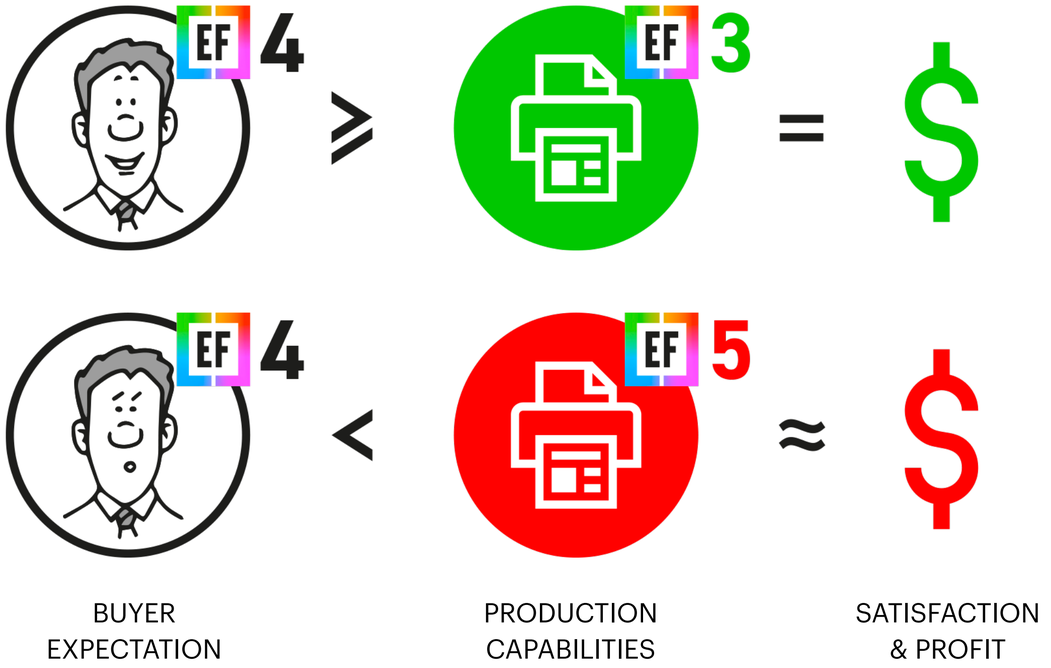
- How many of you are running a plant wide E-Factor Tolerance?



Link Color Expectation to Print Capabilities

Can Printer meet Customer Exceptions?

Manufacturing: Take raw materials, create a product that consistently meets customer expectations

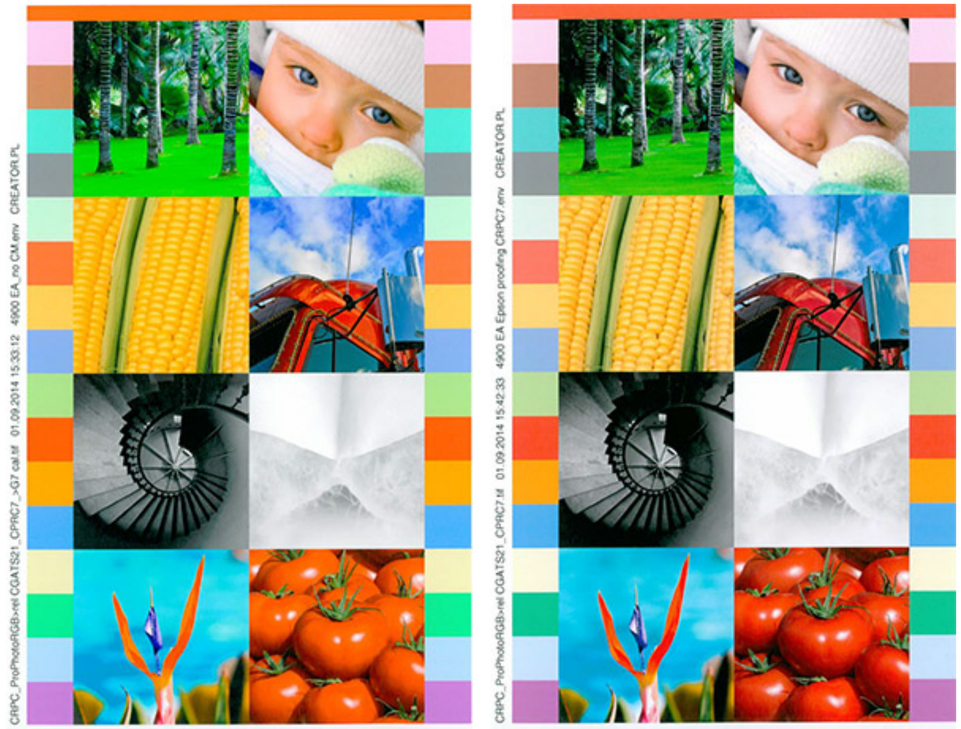


Why Not Use G7 to define Color Match?

Both are G7 Compliant – but NOT ACCEPTABLE

- E-Factor = 7, not acceptable for many people
- Have multiple G7 prints, not match
- Not Color Conformance

EF = 7

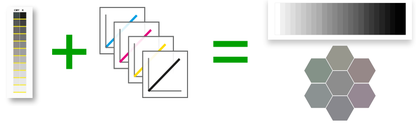


Actual Sample – HP Indigo: G7 Curves vs ICC Profiles

Better Process Control, better Color Conformance to GRACoL

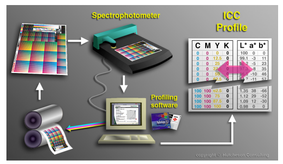
- Apply G7 tone reproduction curve
  - Only affects tonality and gray balance

EF = 5.5



- Apply ICC Profiles, or ICC DeviceLinks
  - Affects Entire color space, CMY tints and Colors

EF = 2.7



Print Manufacturing: Salable Numbers

ROAD MAP TO ANALYTICS BASED PRINT MANUFACTURING

SUBJECTIVE PERSONAL-BASED JUDGMENT — METRICAL-BASED JUDGMENT SCIENTIFIC

VISUAL ASSESSMENT • COMPARATIVE COLOR MEASUREMENT • ADVANCED COLOR MEASUREMENT

Printing any way, any day

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Personal perception-based comparision to physical standard

- no knowledge required
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- dependent on the person
- lighting conditions related
- uncontrolled metamerism
- no repeatability
- initial swatch-book inaccuracy
- instability of color samples
- different substrate / OBAs
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EF = 7+

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EF = 5-7

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EF = 4-5

SPECTRAL AIM

Instrument-based comparision to spectral standard

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- trackable instrument precision and stability
- optional inter-instrument agreement harmonization

EF = 2-3

Printing same way every day

Profitability Critical for Sustainability

75% Printers operate on less than 2% margin*

- Most Operators don’t understand Profitability
  - Work hourly – do job over – no problem, more hours
- $100 waste requires $2000 additional sales to make up
  - Every rejected job hurts your company
- Management to provide tools and education to improve profitability
  - Help operators be accountable, rewards, feedback

* 2020 PIA Survey

Operators Instantly Know if Acceptable

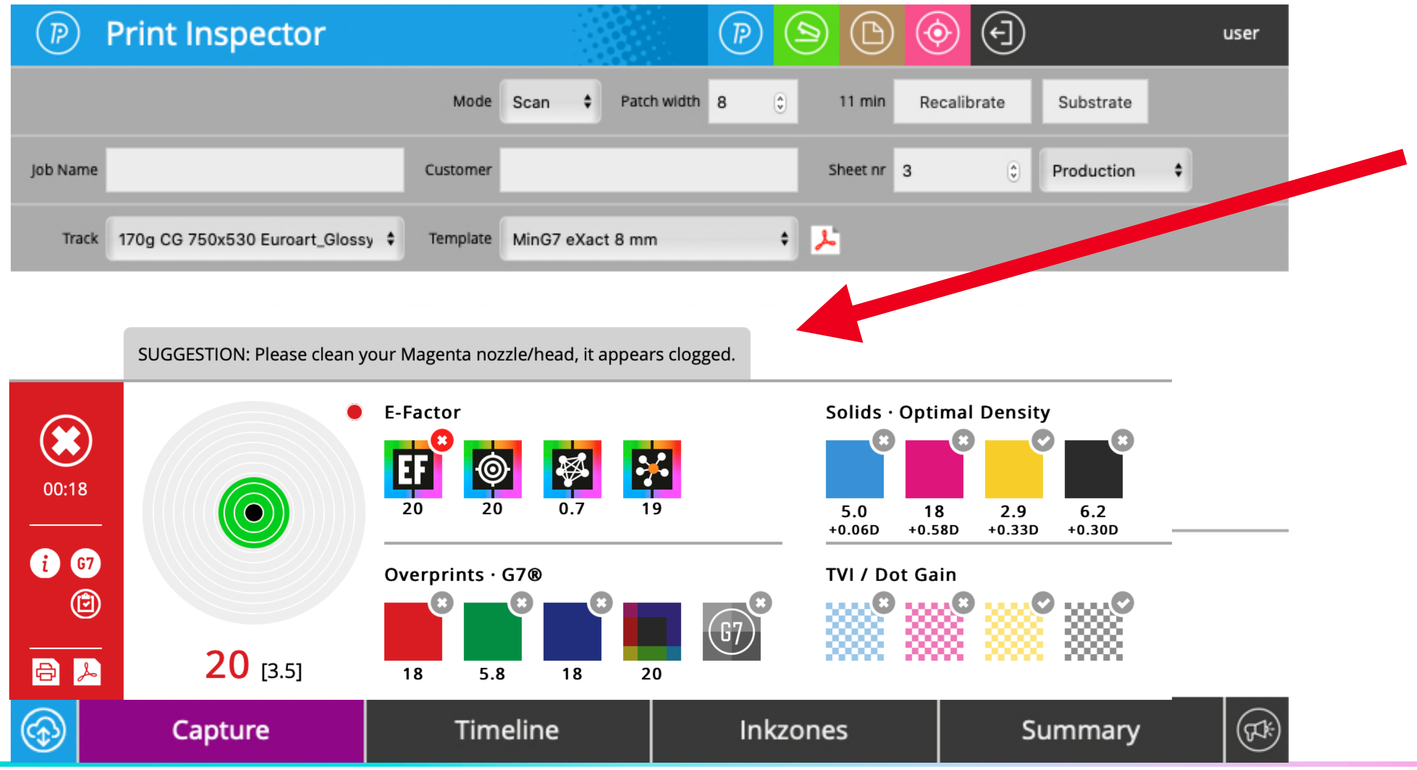
Print, Measure, Simple Pass/Fail based on Color Conformance

- **Green is salable, Red is not**

Operators Instantly Know if Acceptable

Print, Measure, Simple Pass/Fail based on Color Conformance

- **Red** is not—- And we want to help direct operator to fix based on print technology and data!



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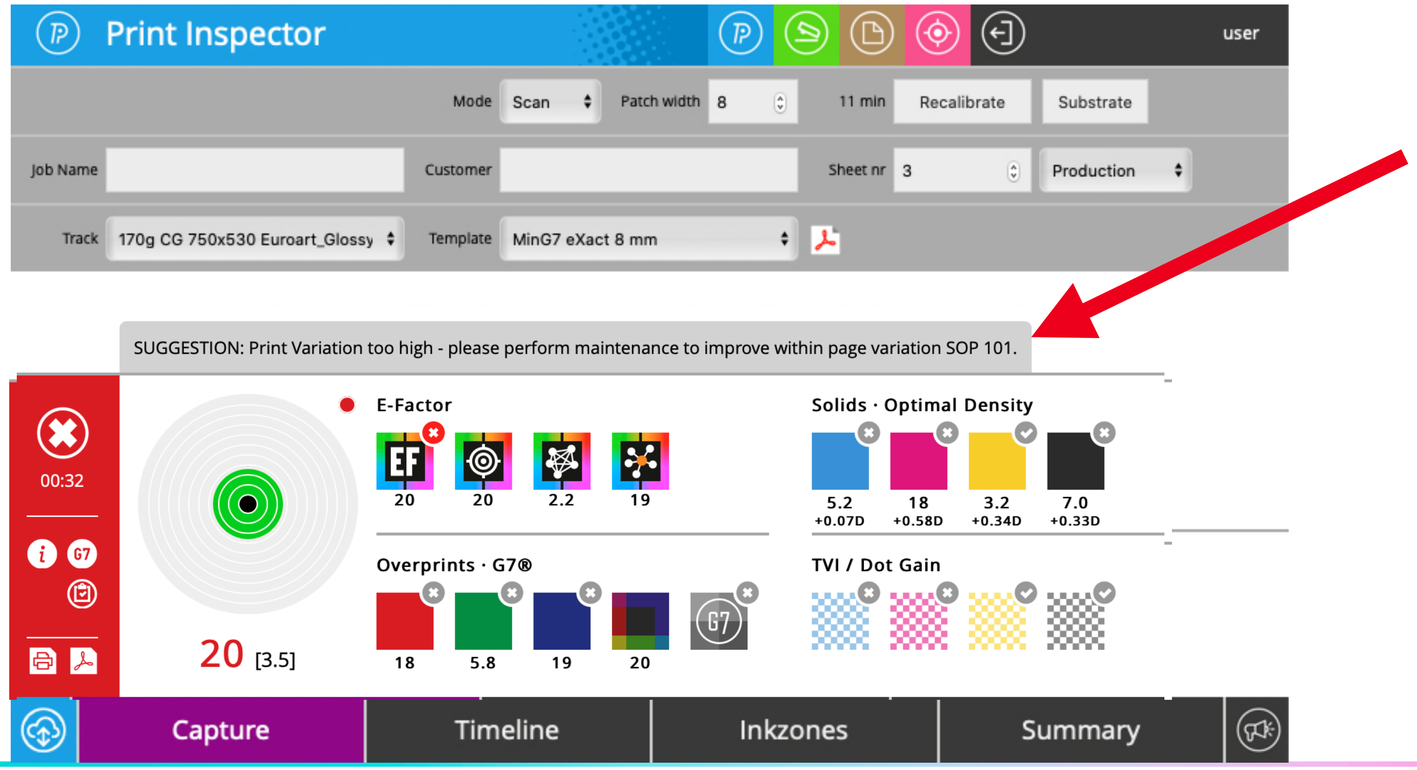


Educating Management on Quality

Maximize Productivity
Efficiency

Minimum Quality
Effectiveness

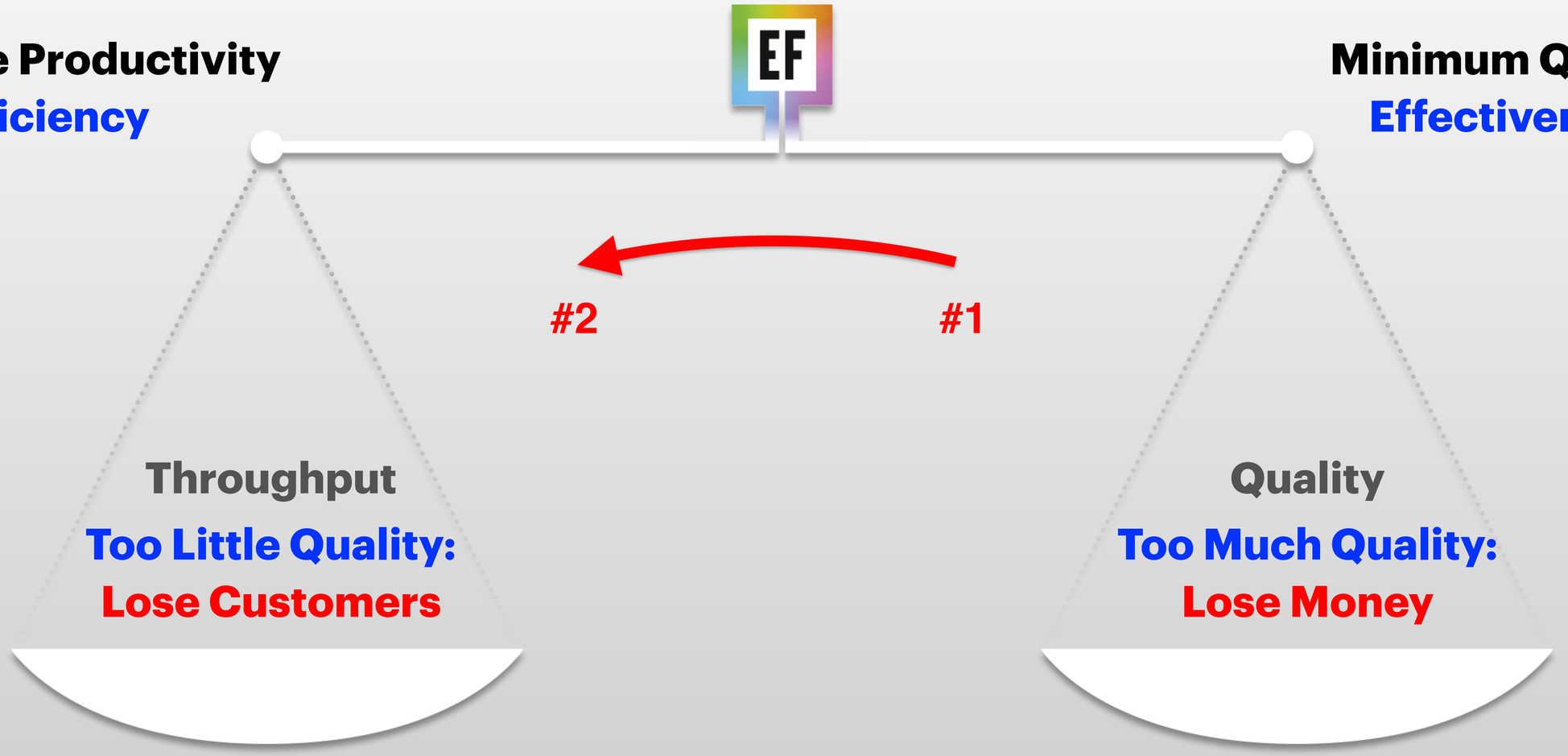
Establish Minimum Quality Requirements

Maximize Productivity

Efficiency

Minimum Quality

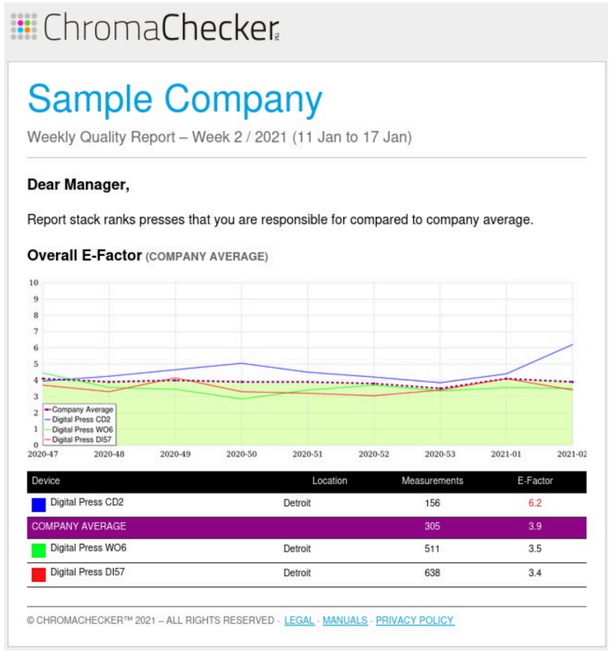
Effectiveness



Continuous Performance Reports

Reporting Salability – Continuous Improvement

- Manager/Operator – KPI:
  - Dotted line shows average, only get data from their printers
- Manager only sees their printers
  - 6 Week trend line – showing improvement (lower is better)?
- Company wide initiative
  - Cloud based, automatically emailed



ChromaChecker

Sample Company

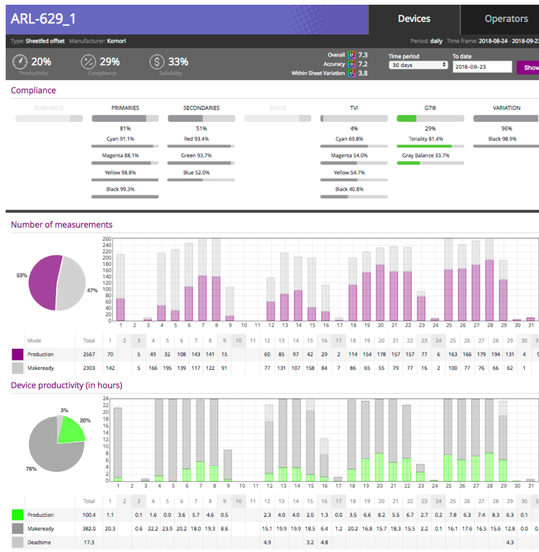
Weekly Quality Report – Week 2 / 2021 (11 Jan to 17 Jan)

Dear Manager,

Report stack ranks presses that you are responsible for compared to company average.

Overall E-Factor (COMPANY AVERAGE)

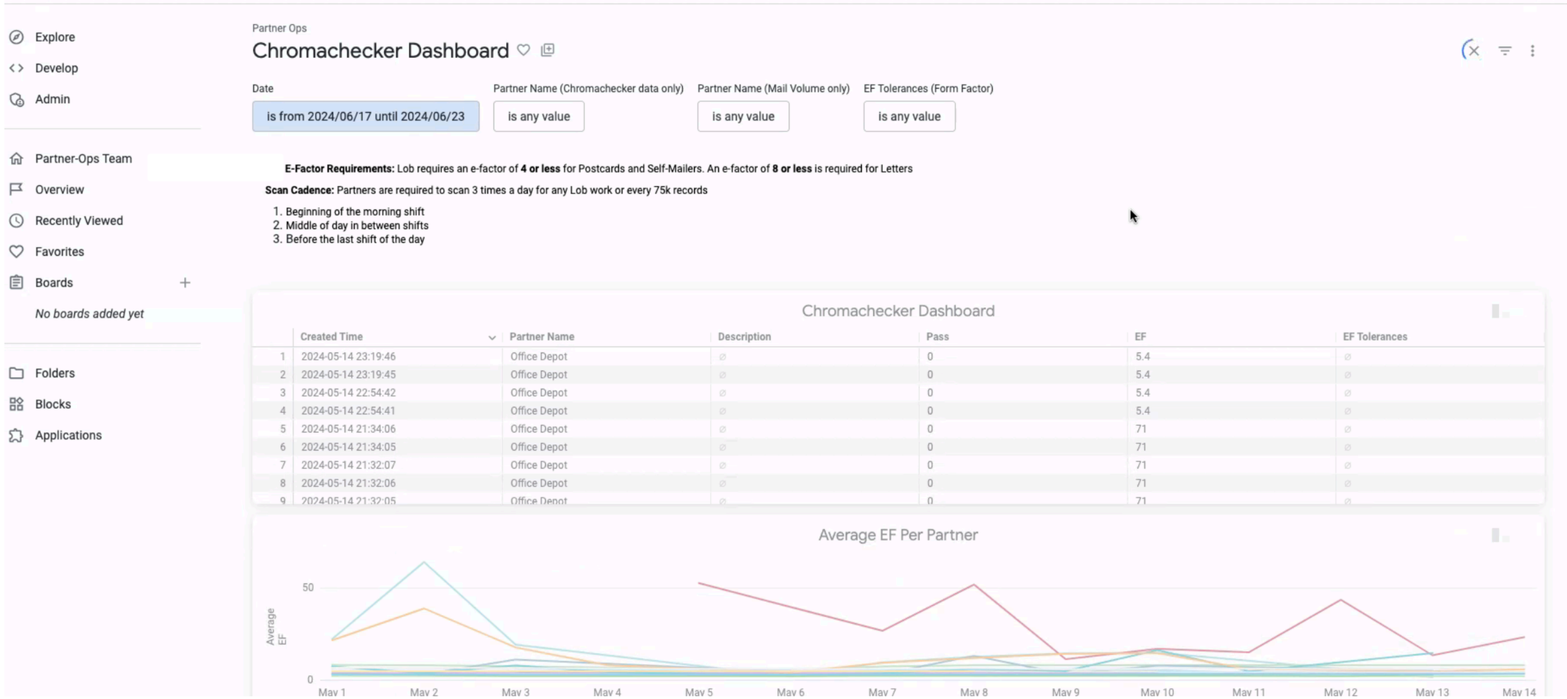
Device	Location	Measurements	E-Factor
Digital Press CD2	Detroit	156	6.2
COMPANY AVERAGE		305	3.9
Digital Press WO6	Detroit	511	3.5
Digital Press DI57	Detroit	638	3.4



Custom Reports Relevant to Business

ChromaChecker API- Merges Quality data with Performance data

- Brand- Know how each provider is performing per level of work…



Where Are You In Your Journey?

Time to Transition to Print Manufacturing

- Utilize both Process Control and Color Conformance metrics
- Efficiently and effectively produce salable goods

Compliment subjective with scientific approach to communications

- Scientifically quantify customers' color expectations with E-Factor
- Concretely know and communicate device capabilities upfront

Balance Throughput with Quality

- Analyze, optimize, and maintain print ecosystem with data
- Employ single digit guidance at management, expert, and operator level
- Take full advantage of continuous print process reporting

Maximize Productivity and Profitability and Sustainability

- Produce salable color, first time every time!

Road Map Implementing Conformance

Project Inspector- Implement Color Conformance

- What Printers to Check and Monitor?
- What Project Template? GRACoL, BestBuy, GMI Other?
  - Includes which reference, brand colors, color bar, tolerance
- Measure printed color bars into respective track using favorite tool
  - Repeat for multiple locations
- Assess how salable the print is?
  - How consistent each print is to themselves over time
  - How accurate each printer is to targeted reference
  - How close each printer is to one another
  - Are brand colors within desired expectations

Where???

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EF = 7+

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EF = 2-3

Printing same way every day

Resources – Thank You

Helpful links

- TAGA CRF 95th Percentile (E-Factor) Research
  https://chromachecker.com/include/img/PMG/Predict%20Color%20Image%20Match_0804-TAGA2017.pdf
- Online E-Factor Exercise
  https://chromachecker.com/cee/en/start
- Online ΔE Spot color exercise
  https://chromachecker.com/colorexercise/en/start

- david@chromachecker.com 651.717.0590