



THE LIGHTS ARE ON BUT NOBODY IS HOME

by John J. Flaig, Ph.D.

There are many different process control methods and procedures available to the practitioner. A popular visual technique employs the stop light analogy:

Green = The process performance is stable and acceptable

Yellow = Warning, the process may be having performance and/or stability problems

Red = The process has become unstable and the performance is unacceptable

The traffic light process control system works as follows [Prevette, 2004]:

1. Specifications for acceptability are established by the responsible authority
2. A dashboard is established with the key process input and/or output variables
3. Every variable has a traffic light
4. If the variable is in the acceptable range, then the light will be green. If the process moves into the warning zone a yellow light appears, and if the process moves into the unacceptable range, then a red light appears.

This system is simple, easy to understand, and is significantly better than just having black and white numeric data displayed in a huge table. However, this control procedure has some serious problems that will be detailed below:

1. The light changing specifications are generally determined by what management and/or



engineering would like to see rather than what in fact is happening in the process. Hence, the light colors will usually bear little resemblance to statistically determined process control limits. As a result in many cases the lights will be stuck on red when the process is actually in control. This creates a serious problem because action taken on a stable system will tend to destabilize it. Management may think this is what they want but frequently they get a nasty surprise.

2. Further, if we have a large number of variables and if many lights are red, then we will have to allocate our investigative resources. However, because there is no relationship between the light color and process stability our allocation of resources may be extremely misguided.
3. On the other hand, if we have a large number of variables and if many lights are green, then there may well be a sense of complacency and disregard of serious process control issues.
4. This is a very weak control procedure because it relies on only the most recent observation to determine the state of the process. The process could be drifting slowly downward but still be green. A statistical control procedure would detect this drift and give the practitioner an early warning but the traffic light systems allows the process to drift until it finally hits a warning specification.

The traffic light system needs to be modified to reflect the actual state of statistical control so that appropriate action can be taken when and only when it is justified. Fortunately, there are powerful control algorithms such as EWMA or Adaptive Control Charts [Flaig, 1991] that can resolve all these issues and provide an excellent control system. In addition to a good control tool the practitioner needs a sound procedure for switching colors and techniques to achieve improvement [Flaig, 2002]. A reasonable methodology is given in Table 1 below.

Table 1: Overview of the Possible X-Chart Outcomes



Control Result	Conformance Result	Color Code	Control Action	Conformance Action
Stable	Yes	C	None	None
	No	NC	None	Use the KPIVs to improve
Unstable (Better)	Yes	C	Look for Special Causes. Use the Special Cause and KPIV information to stabilize the IMPROVED	None
	No	NC	Look for Special Causes. Use the Special Cause and KPIV information to stabilize the IMPROVED	Use the Special Cause and KPIV information to improve
Unstable (Worse)	Yes	C	Look for Special Causes. Use the Special Cause and KPIV information to stabilize the process.	None
	No	NC	Look for Special Causes. Use the Special Cause and KPIV information to stabilize the process.	Use the Special Cause and KPIV information to improve

Reference:

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Prevette, S. (2004). Stoptlight Charts with SPC inside, Quality Progress, ASQ Milwaukee, WI. Vol. 37, No. 10.

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Humorous Commentary

Upon reading this paper a friend sent me the following:

I have a little humor to add to your excellent paper.

We must differentiate between a Traffic Light Chart and a Christmas Tree Chart. A traffic light chart is intended to bring action and should be based on some type of statistical methodology to be effective. Your feedback is valid for a Traffic Light Chart.

What you have in our report is what I refer to a Christmas Tree chart which is based on the concept of "what you hope Santa will bring you for Christmas". Statistics have little relevance to the goal setting process that drives this chart because we believe in Santa.