Analytical – Allocation Analysis – Reliability Specifications

The purpose of this example is to illustrate how the allocation analysis tool can be used to set reliability specifications for components within a system.

Consider the system in the "System" diagram:

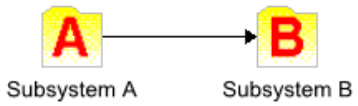

Figure 1: System

Assume that the reliability target at the system level is 95% at 500 hours. The current reliability at 500 hours is 93.48%, calculated using the QCP as shown in Figure 2.

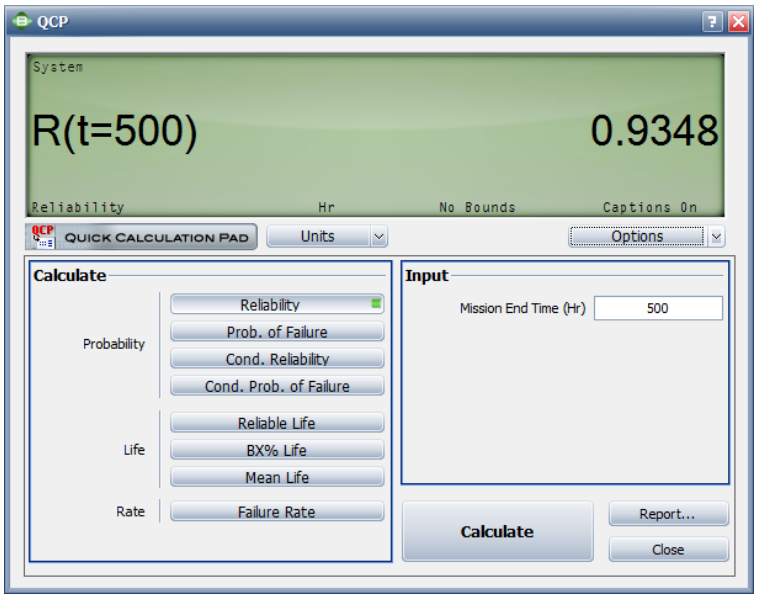

Figure 2: Reliability at 500 hours

The goal is to allocate reliability to the subsystems and lower level assemblies and components in such a way that the overall system reliability goal is met and the cost of reaching that goal is minimized.

To do this, an allocation analysis was created using the Cost Optimized allocation type. Figure 3 shows the allocation analysis, performed at the system level.

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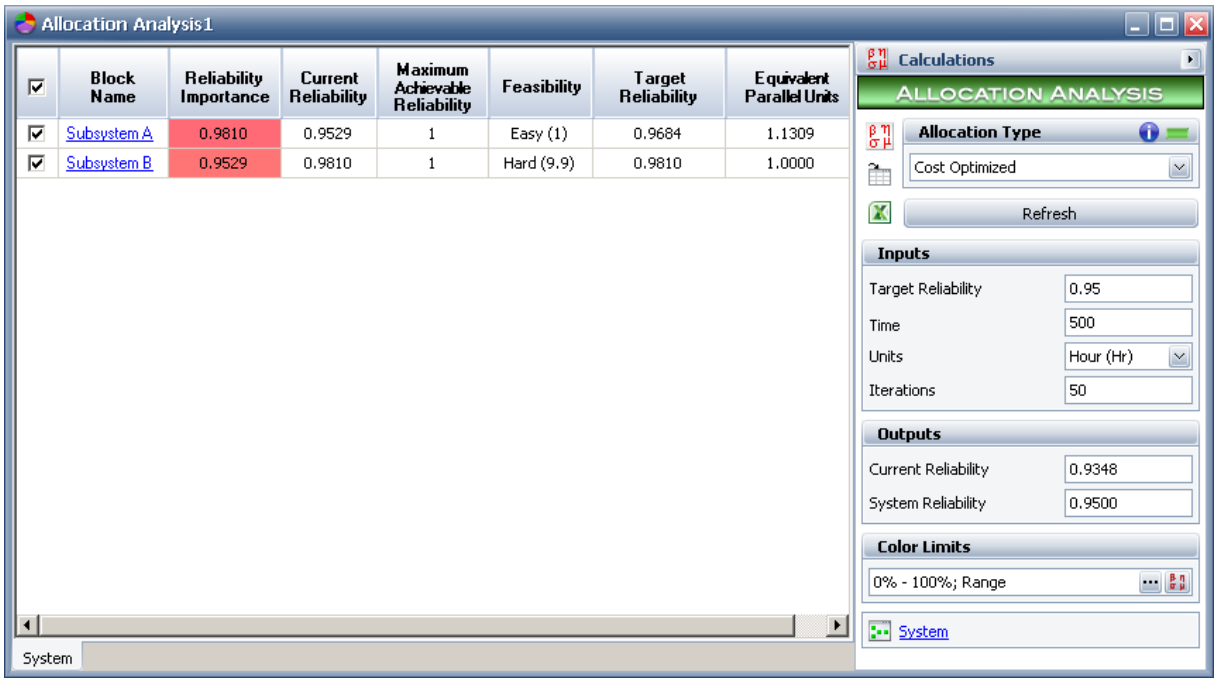

Figure 3: Allocation analysis for the system

As seen in Figure 3, both subsystems were included in the analysis. The Reliability Importance column, which is calculated automatically, gives an indication of which subsystems or components are more critical and should be included in the allocation analysis. The Feasibility column allowed the analyst to provide a qualitative measure of how hard or easy it would be to make improvements to a subsystem or component based on design issues, supplier issues, time required, resources required, etc. In this case, Subsystem A was determined to be easy to improve, while Subsystem B was considered hard to improve.

The analyst specified a Target Reliability of 0.95 at a Time of 500 hours in the control panel. Upon calculation, the target reliability and the number of equivalent parallel units for each subsystem was determined. In this case it was found that in order to reach the 95% system reliability goal while minimizing cost, Subsystem B should remain unchanged and Subsystem A should be improved from 95.29% reliability to 96.84%.

To determine how to improve the assemblies within Subsystem A in order to reach the 96.84% goal, the analyst clicked the Subsystem A block name in the allocation analysis. A new tab was created, listing all the assemblies within Subsystem A, as shown in Figure 4.

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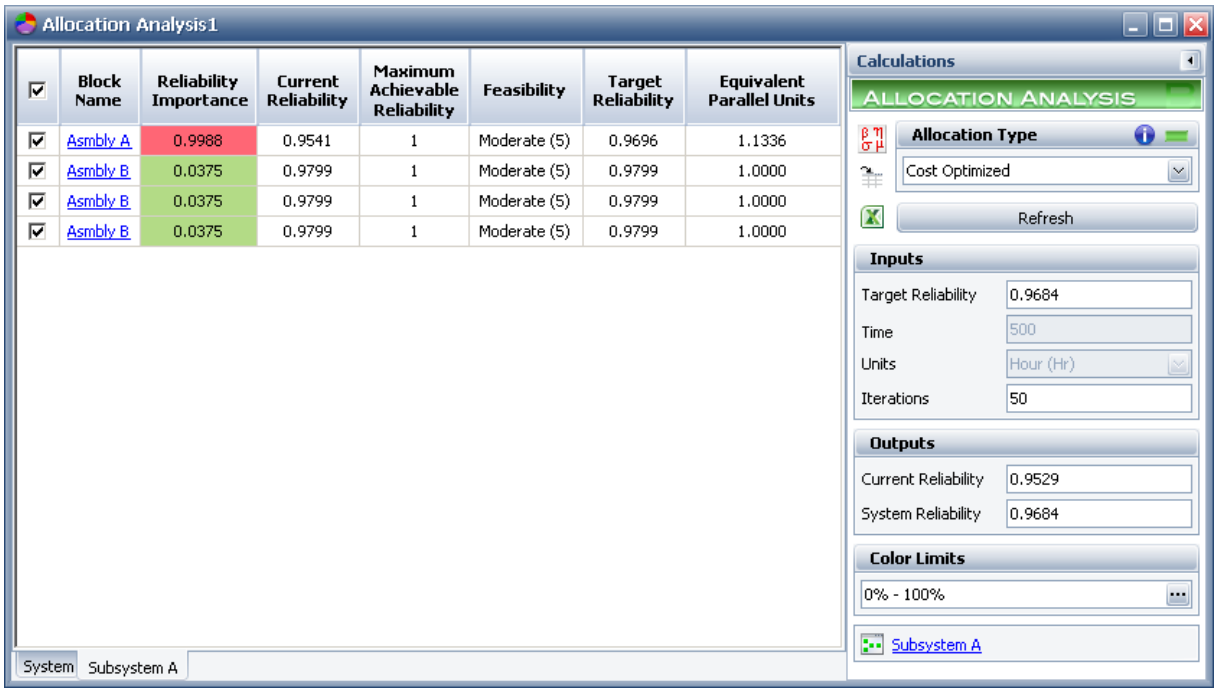

Figure 4: Allocation Analysis for Subsystem A

Note that the Target Reliability in the control panel was automatically set to 0.9684, as determined in the higher-level allocation analysis. The analyst then set the appropriate feasibility value for each assembly to calculate the new target reliability for values. In this case, only Assembly A needs to be improved to 96.96%. Following the same steps, the analyst clicked the Asmbly A block name to create a new allocation analysis tab that listed the components of Assembly A, as shown in Figure 5. *Edit: Assembly*

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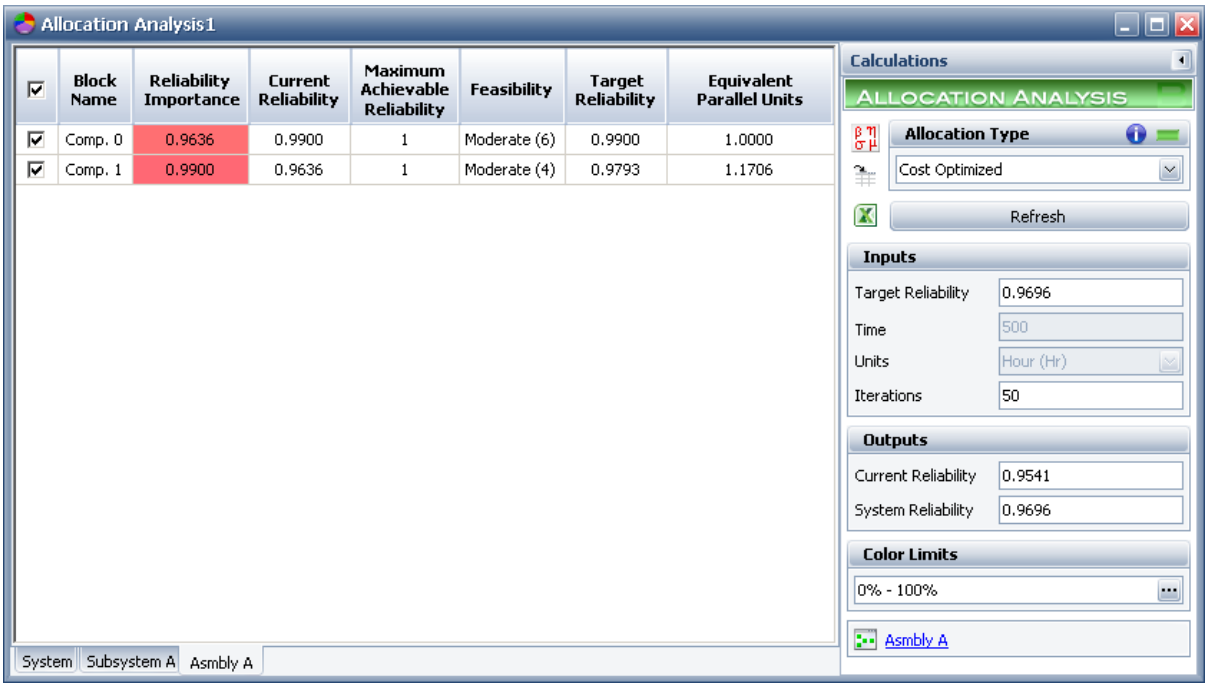

Figure 5: Allocation Analysis for Assembly A

Again the Assembly A target reliability was automatically transferred as an input. After setting the feasibility values for the two components, the analyst found that Component 1 needs to be improved to 97.93% reliability.

Conclusions

This simple example illustrated how we can use the allocation analysis tool in BlockSim to flow down requirements from the system level to the component level in order to reach the system reliability goal while minimizing the overall development cost.

Disclaimer:

Examples provided herein are purely for illustrating software features and functionality. They are not intended to accurately represent any real physical process or real test data.

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