

ARL-unbiased geometric control charts for high-yield processes

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The geometric distribution is the basic model for the quality characteristic that represents the cumulative count of conforming (CCC) items between two nonconforming ones in a high-yield process.

In order to control increases and decreases in the fraction nonconforming in a timely fashion, the geometric chart should be set in such way that the average run length (ARL) curve attains a maximum in the in-control situation, i.e., it should be ARL-unbiased.

By exploring the notions of uniformly most powerful unbiased tests with randomization probabilities, we are able not only to eliminate the bias of the ARL function of the existing geometric charts, but also to bring their in-control ARL exactly to a pre-specified value.

Instructive examples are provided to illustrate that the ARL-unbiased geometric charts have the potential to play a major role in the prompt detection of the deterioration and improvement of real high-yield processes.