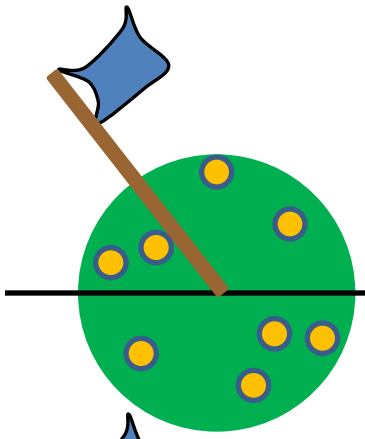
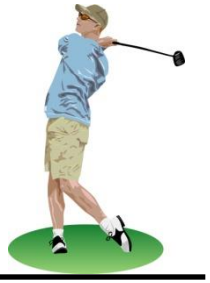
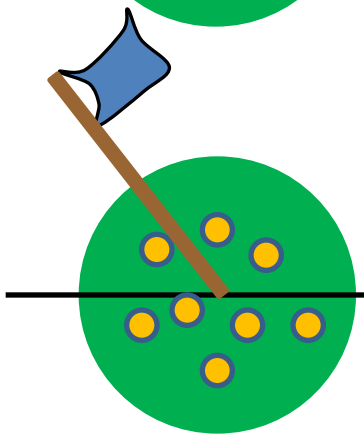
Conventional method: Adjust distance and then adjust swing

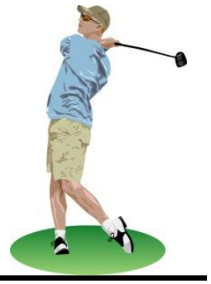


①Shot at the hole

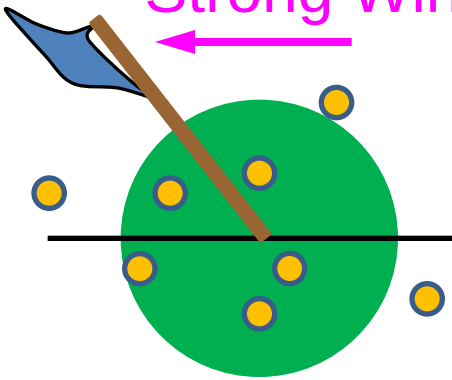




②Adjust deviation to small

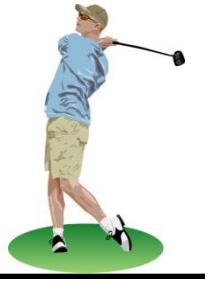


Strong Wind

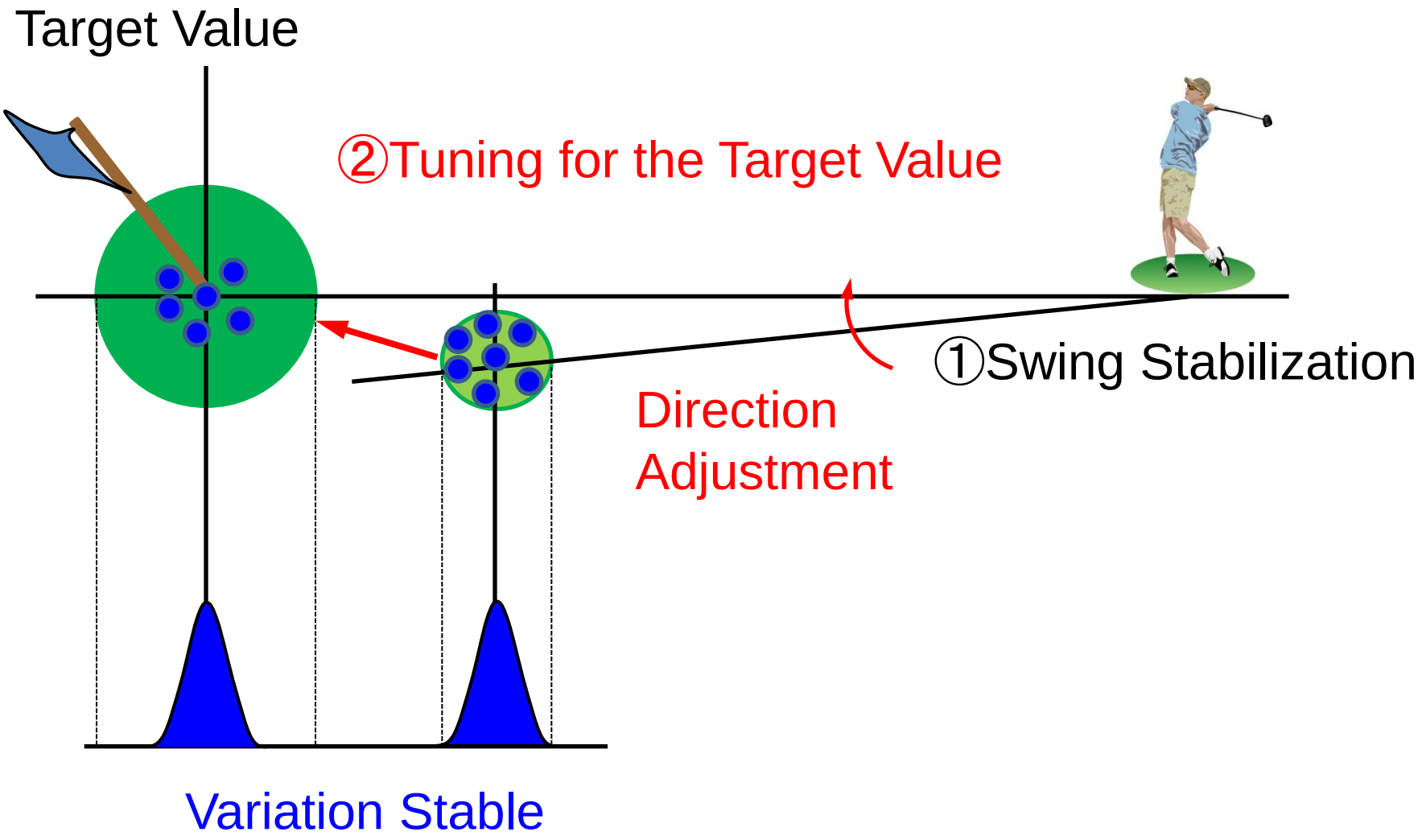


Weak to noises → Variation

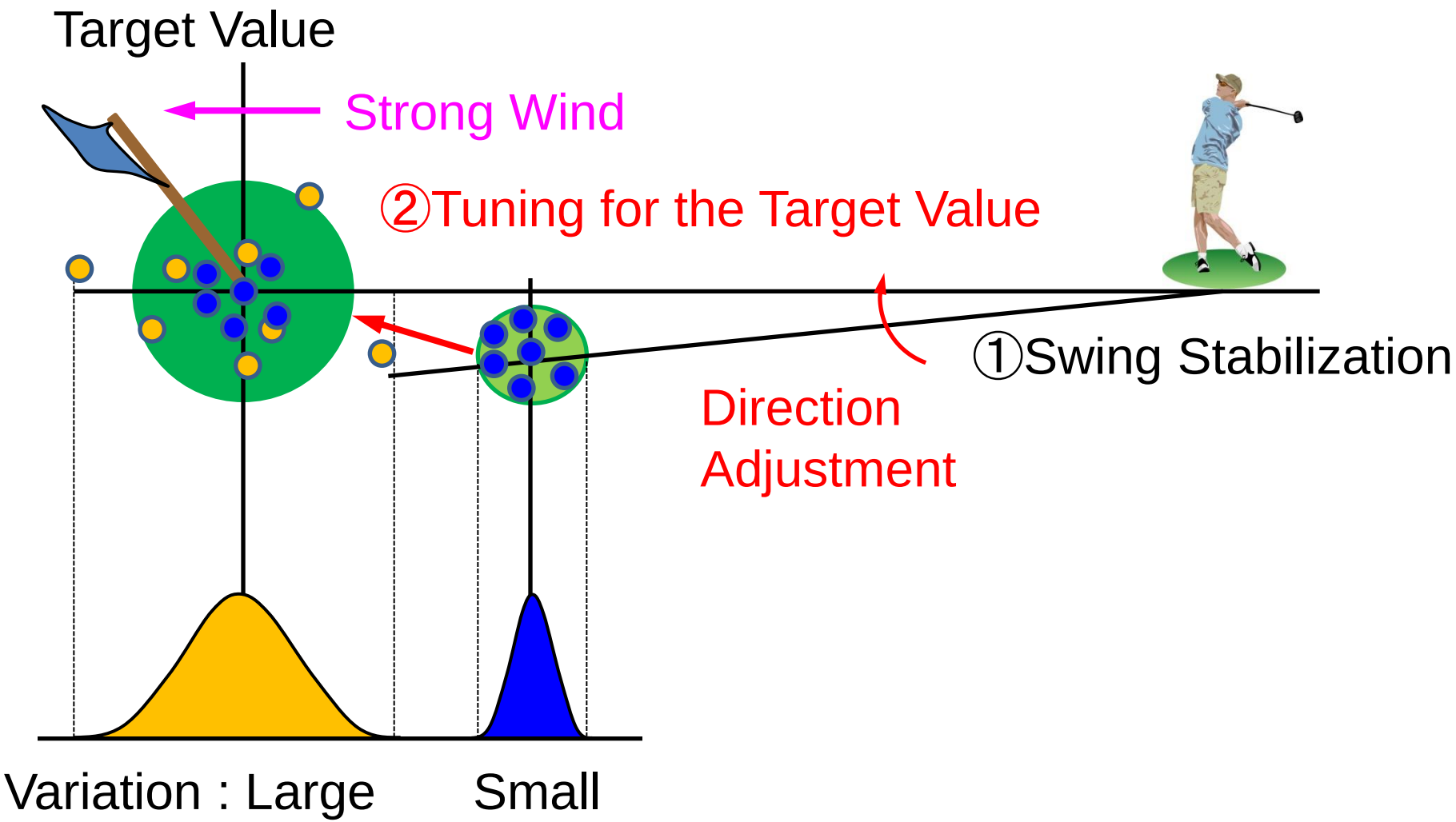
noises：ball striking position, wind direction, clubface metal, physical strength, etc.



Quality Engineering: Stabilize swing first, then adjust distance

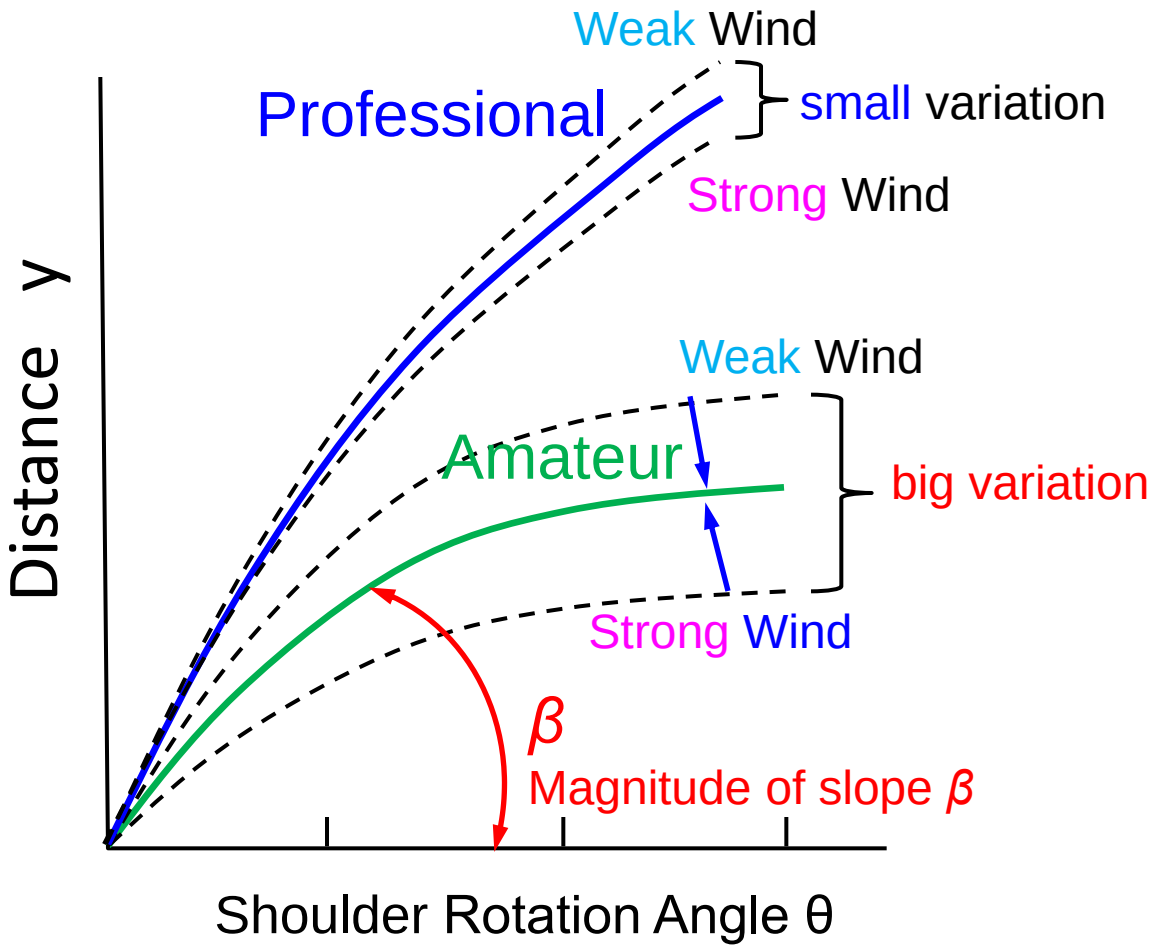


Comparison between Conventional Method and Quality Engineering



2-Stage Design: Improve Variation, then Adjust Distance

Ideal functionality : Body Rotation Angle and Distance are Proportional



Body Rotation Energy

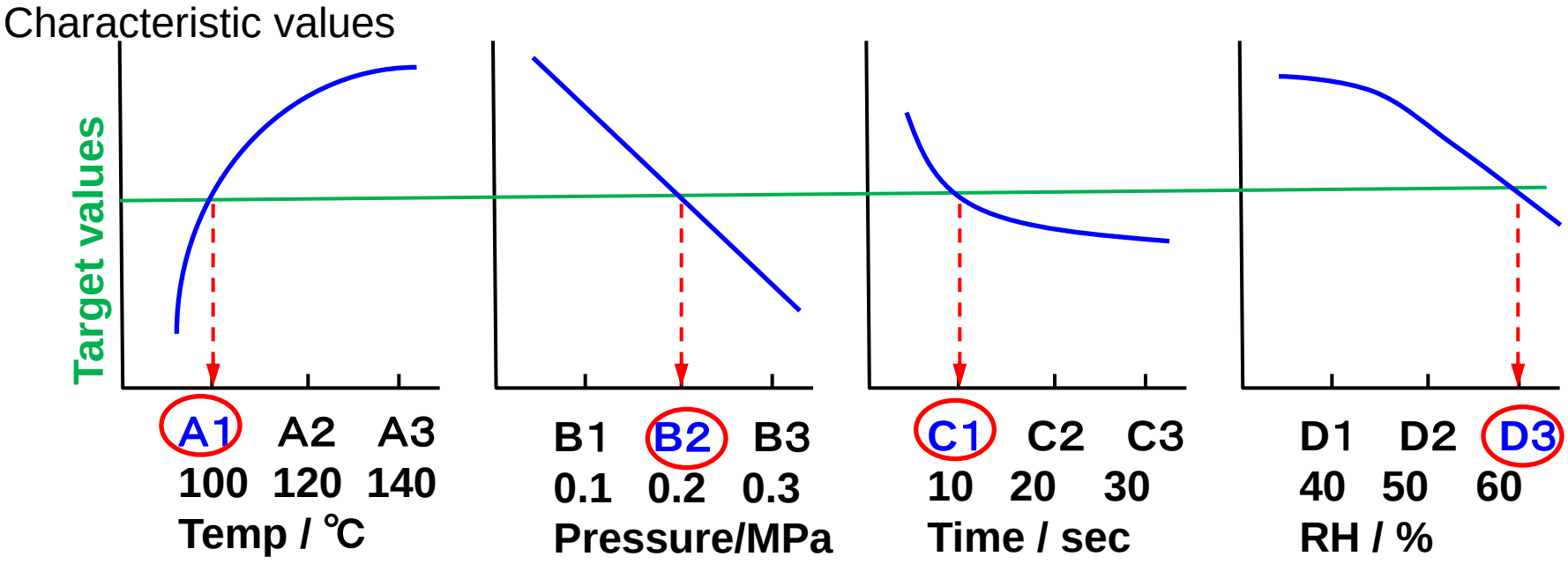
Ball Movement Energy

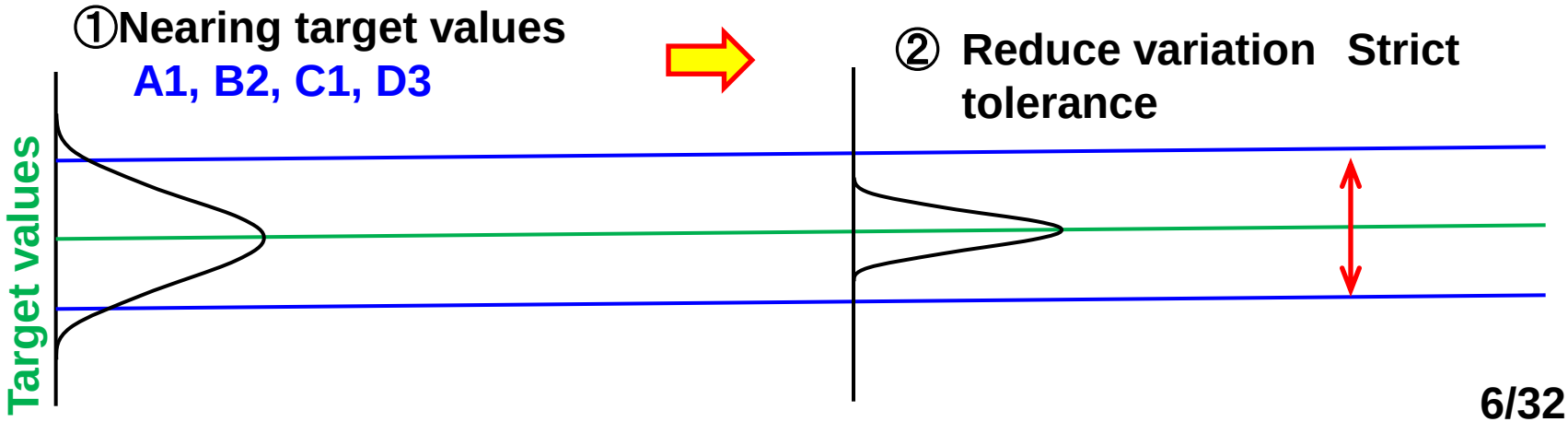
$$\frac{1}{2}k\theta^2 = \frac{1}{2}m\left(\frac{dy}{dt}\right)^2$$

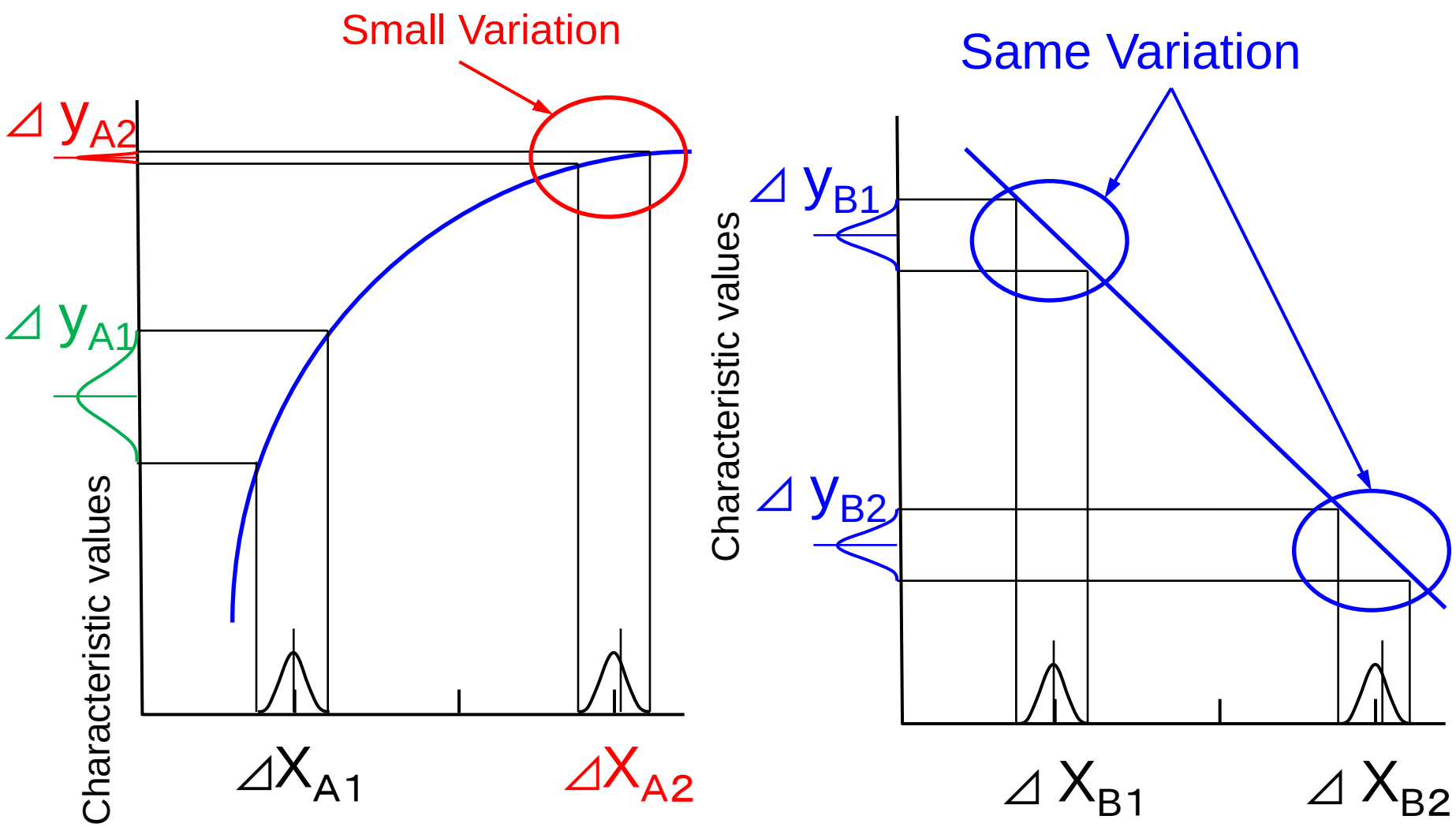
$$y = \beta\theta$$

Control Factors: Position of Arms, Back, Legs, and Swing Path

Conventional 2-Stage Design



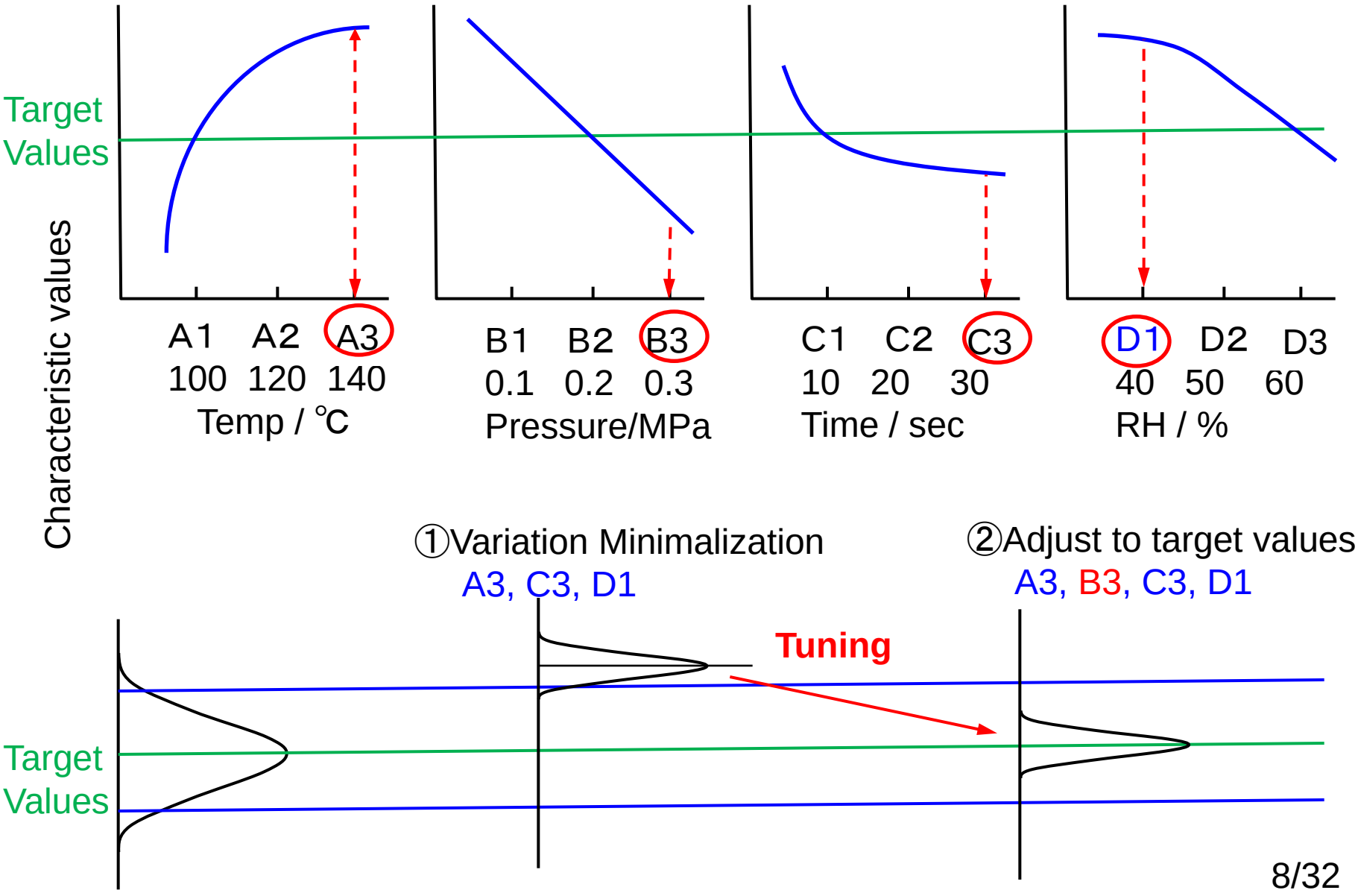




$$\Delta X_{A1} = \Delta X_{A2} = \Delta X_{B1} = \Delta X_{B2}$$

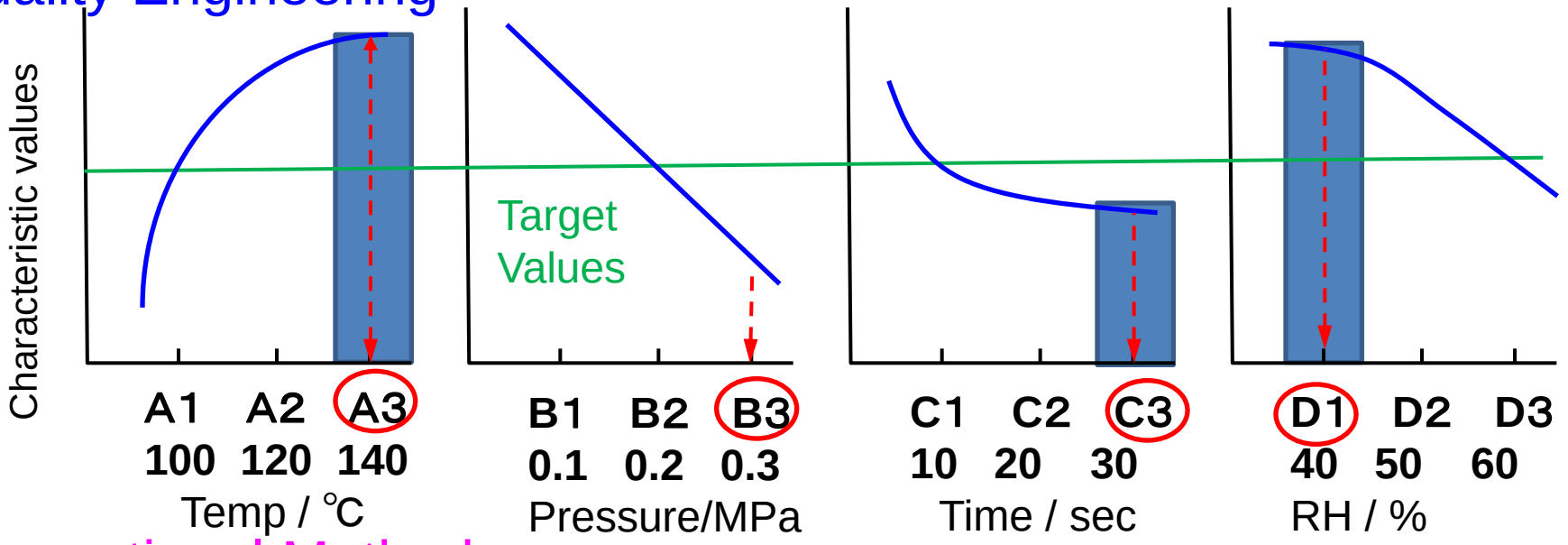
$$\Delta y_{A2} < \Delta y_{B1} = \Delta y_{B2} < \Delta y_{A1}$$

Quality Engineering 2-Stage Parameter Design



Q. Which method do you select？

Quality Engineering



Conventional Method