

# Simplified perfusion process control

A ten year profile

# Statistical process control

$$W \frac{(ucl)}{(lcl)} \sum_{r \geq w} \frac{e^{-np}}{r!} \frac{(np)^r}{r!} \leq \frac{1}{40}$$

$$UCL \bar{x} = \bar{\bar{X}} + A_2 \bar{R}$$

*(Poisson approximation)*

$$LCL \bar{x} = \bar{\bar{X}} - A_2 \bar{R}$$

# What are the chances?

$$P \propto L \times t$$



# SPC

DETECT CHANGE

FIND CAUSE(S)

MAKE ADJUSTMENTS



# What is the process?

- Objectives during CPB

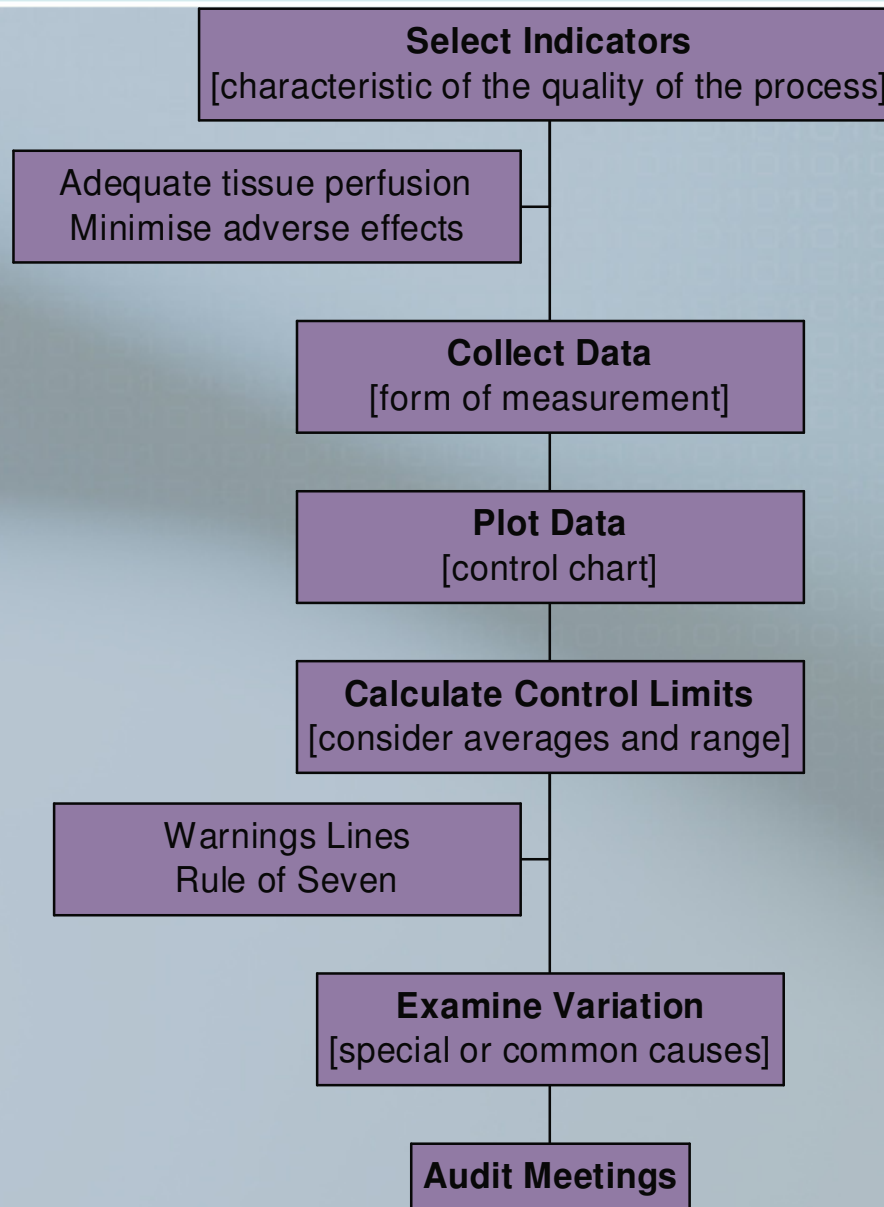
1. Tissue perfusion
2. ↓ adverse effects

# Perfusion indicators

- pH
- pO<sub>2</sub> (max/min)
- MABP
- SBE
- Hb
- Urine
- ACT
- Temp



# Simplified process control



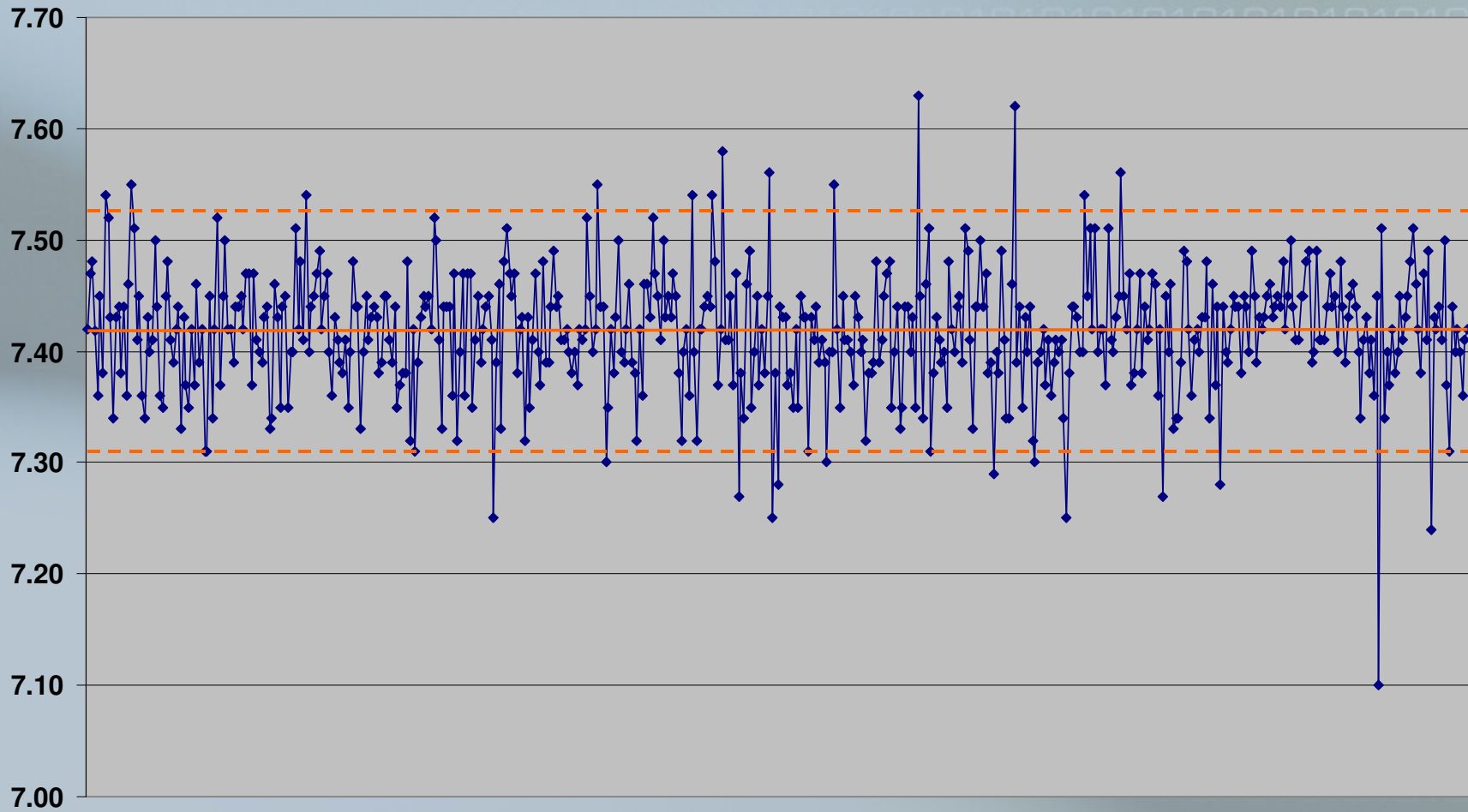
# Process variation

- **Common causes** (residual variation)
- Influence all measurements in the same way
- Difficult to identify

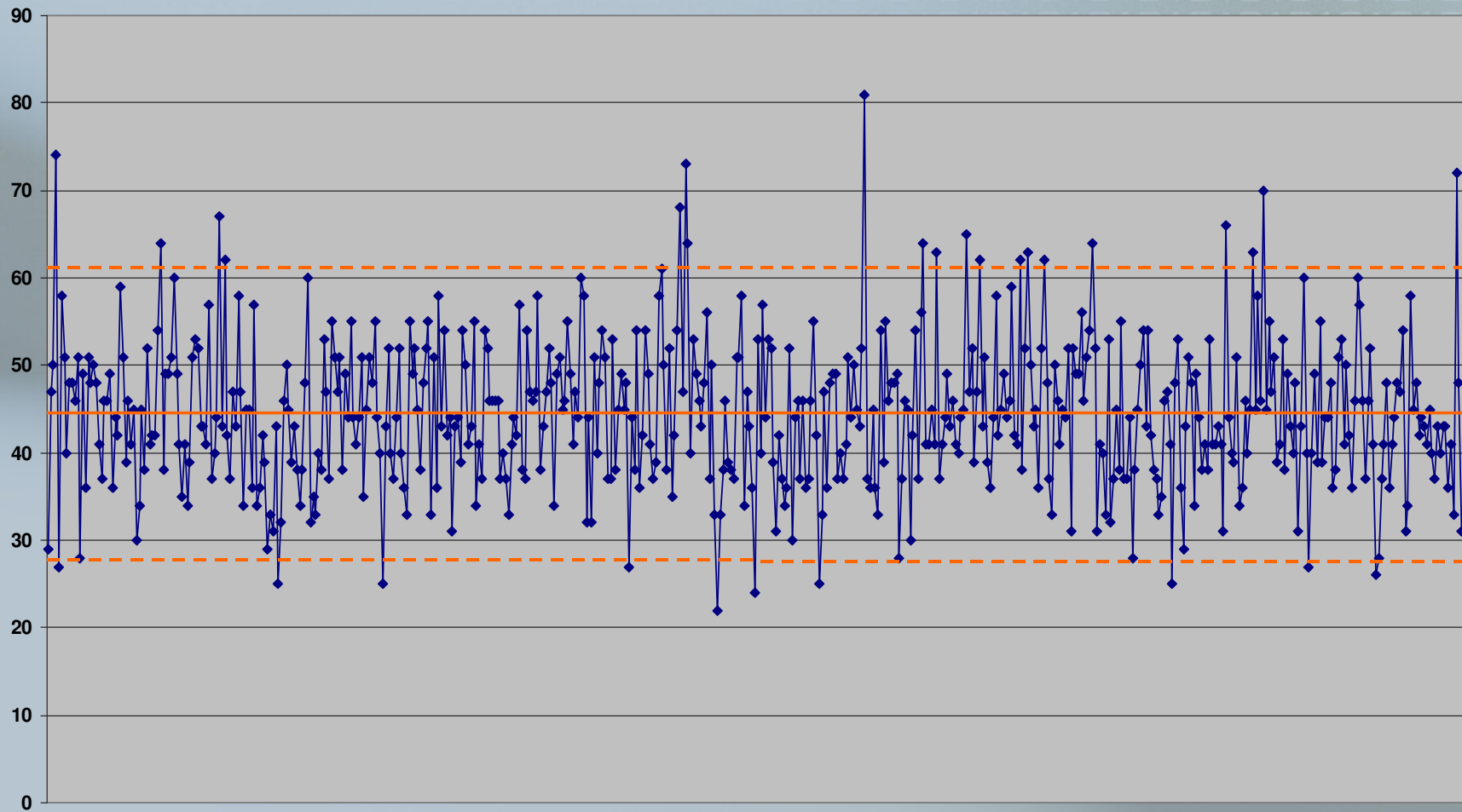
# Process variation

- **Special causes** (assignable causes)
- Influence some/all of the measurements in different ways
- Unusual patterns of variation on a control chart

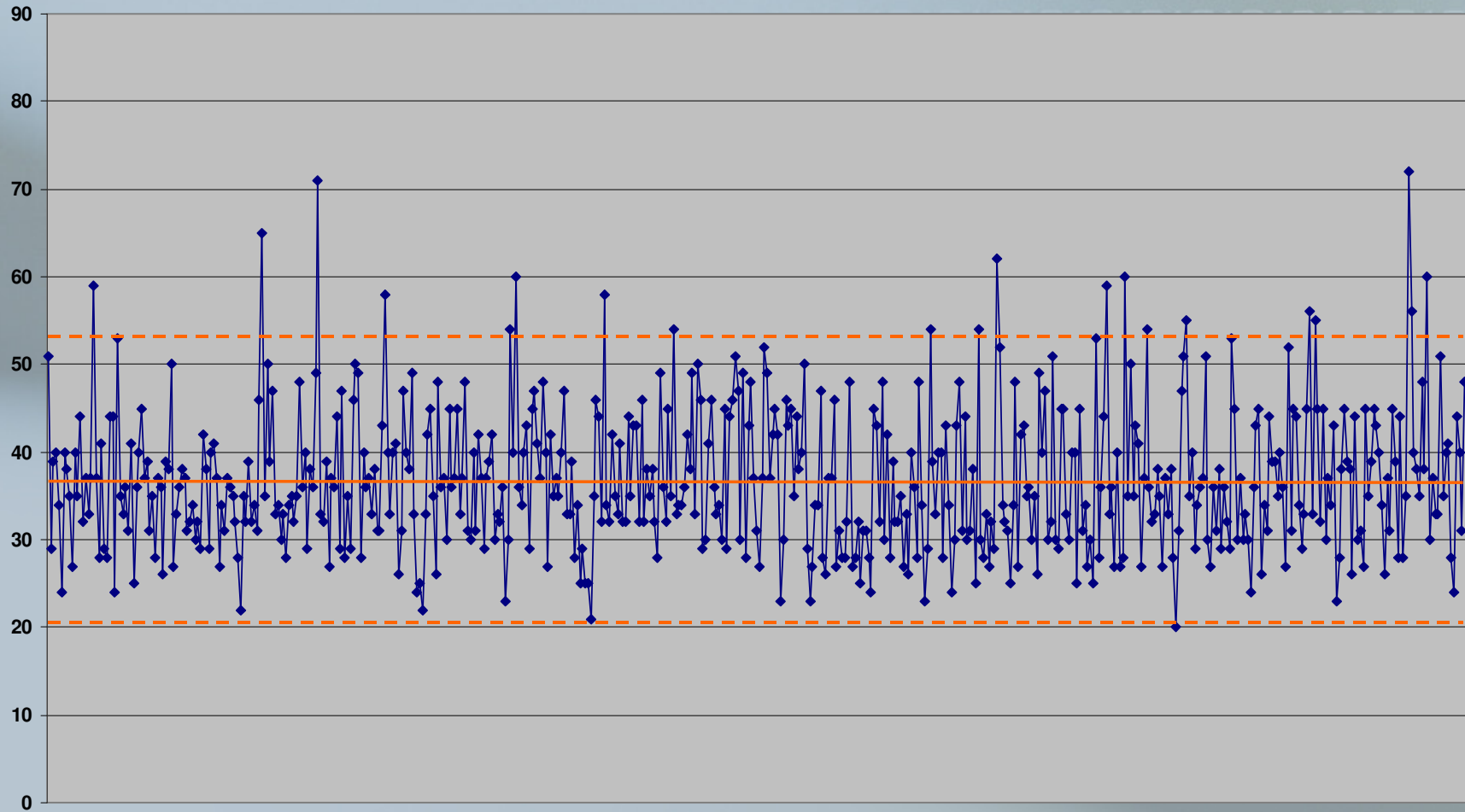
# Run chart for pH



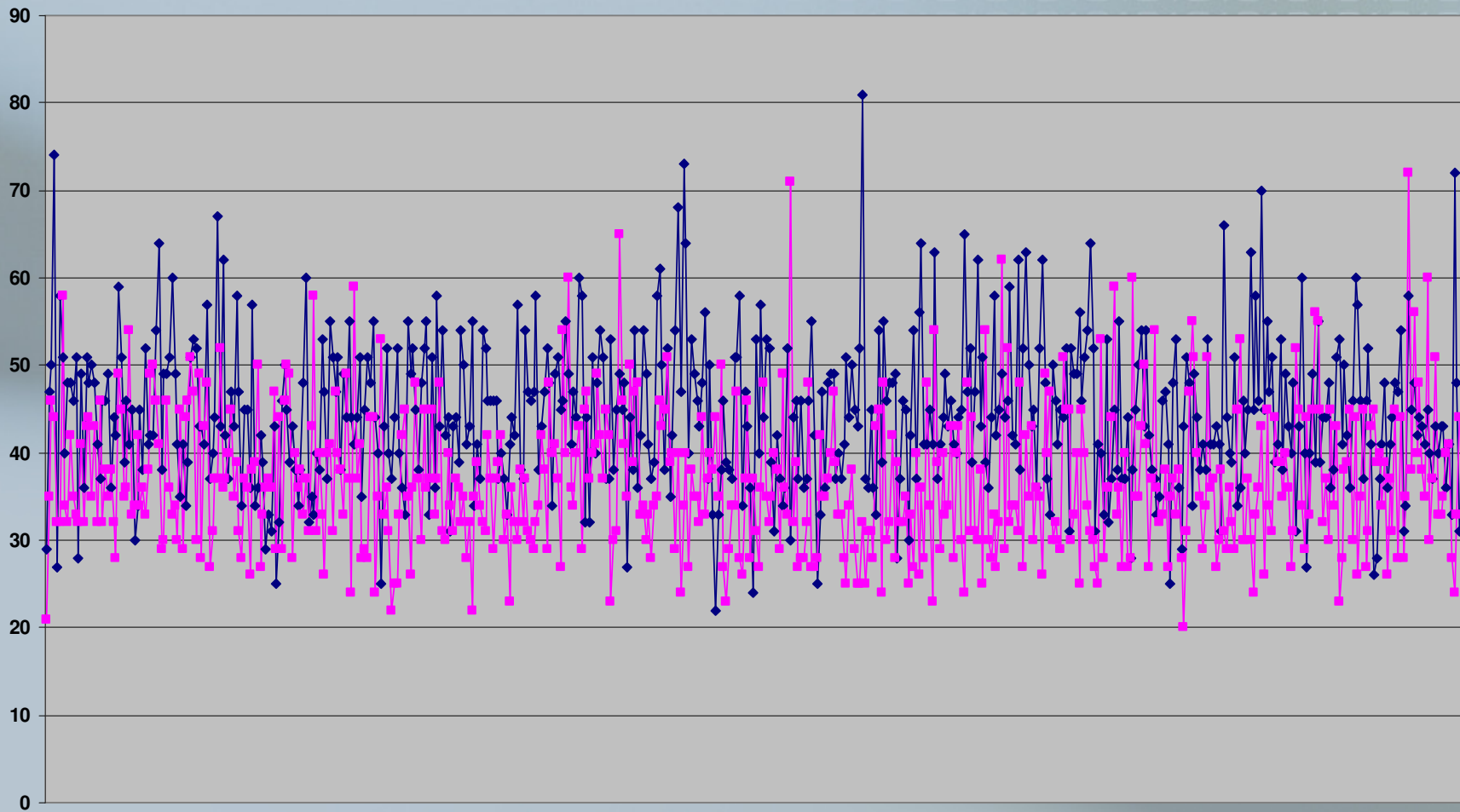
# Max pO2 during 2003



# Max pO2 during 2006



# Impact of inline pO2



# Conclusion

- Process is 'under control'
- Assignable causes have been removed
- Future with electronic data capturing



# Thank you

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