Using Six Sigma “Lean” for Process Improvements

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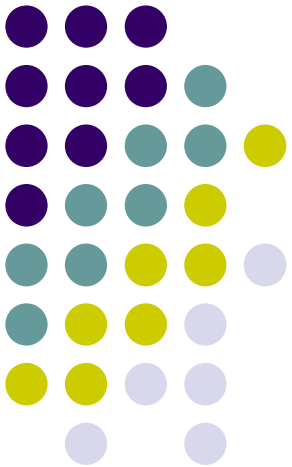
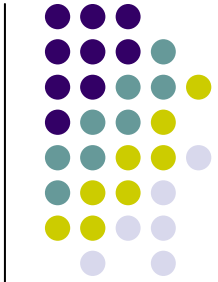
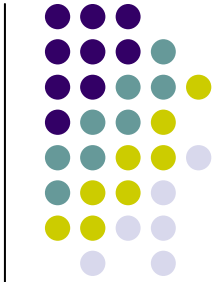


What is Six Sigma?



- Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects and minimizing variability in processes.
- Data Driven Problem Solving
  - Simple and generic, but rigorous approach.
  - Problem focused.
  - Data driven at every phase.
  - Graphical techniques

What Makes A Six Sigma Project?

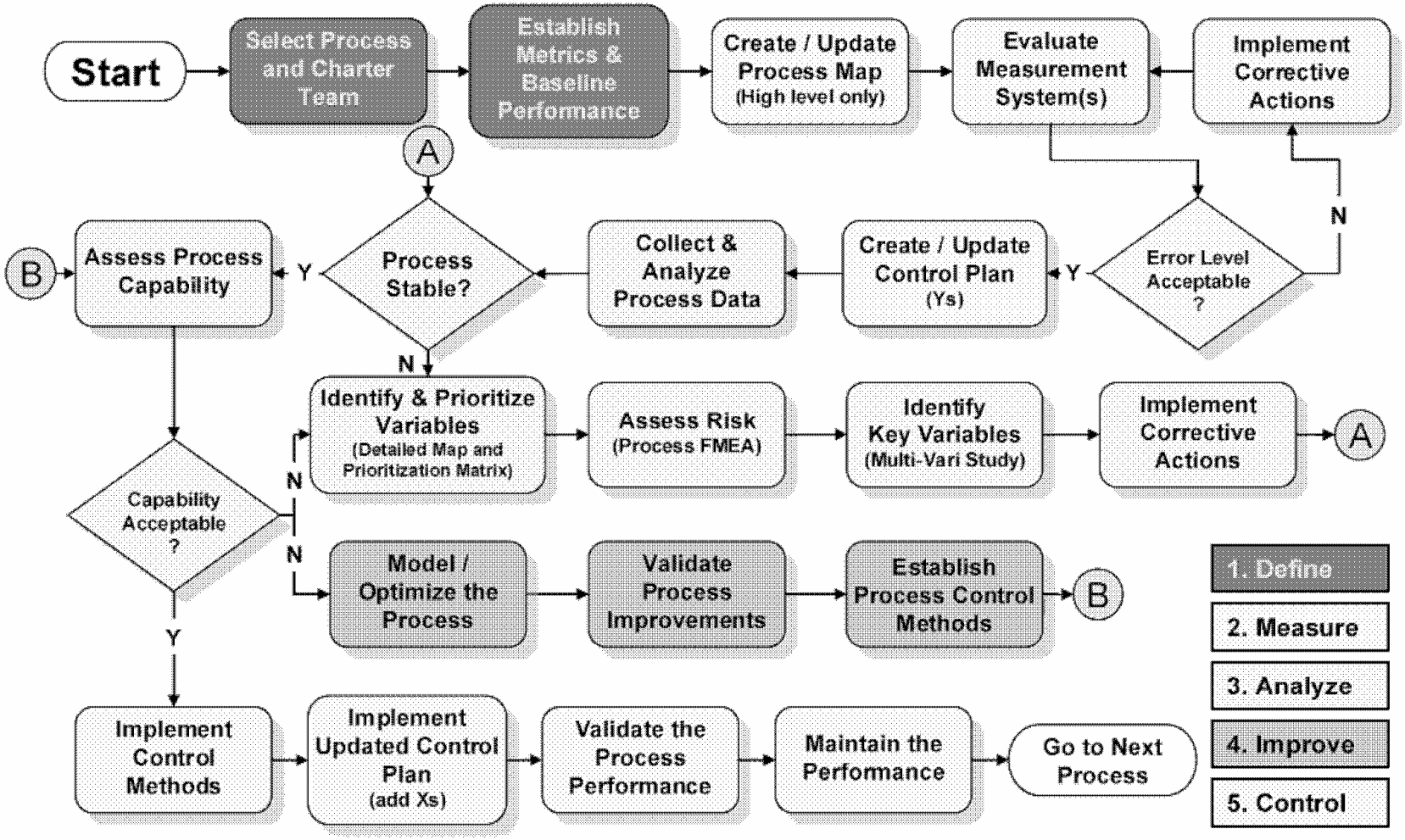


- Clearly connected to business priorities.
- Major importance to the organization.
- Reasonable scope. Completion in 4-6 months.
- Measureable quantity for success.
- Supported and approved by management.

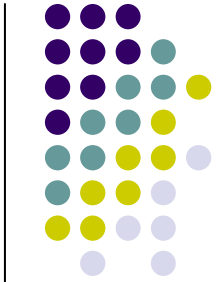
DMAIC Process

- Define the problem and the project goals.
- Measure key aspects of the current process and collect relevant data.
- Analyze the data to investigate and verify cause-and-effect relationships.
- Improve the current process based upon data analysis to create a revised process.
- Control the revised process to prevent defects.

The Six Sigma Process



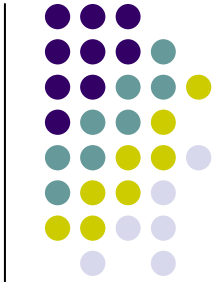
Leaning the Six Sigma Process



- Shorten the timeframe for small project completion

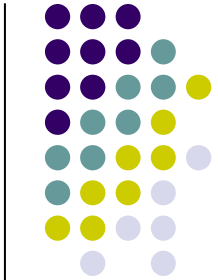
- In consideration of one's knowledge of the project, evaluate the six sigma project as a whole and delete non-essential steps.

The Project



- Boiler chemicals are used to reduce corrosion and reduce scale build up.
- Reduce boiler chemical cost by $50,000 or by 40% annually.
- Current chemical usage: 22 liters per day.

Define



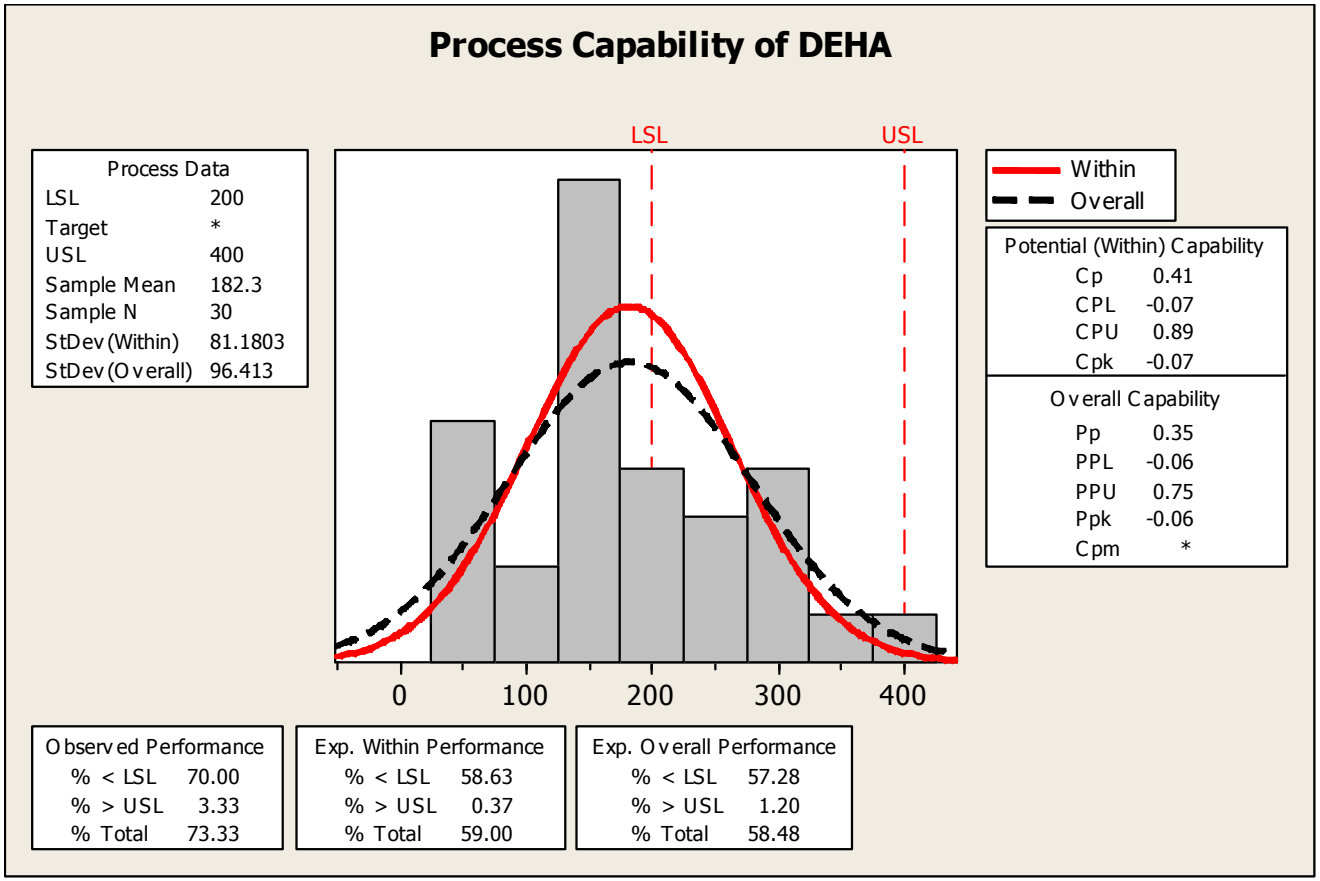
Used Tools

- Define the problem
- Baseline Performance
- Gain management approval

"Leaned" Tools

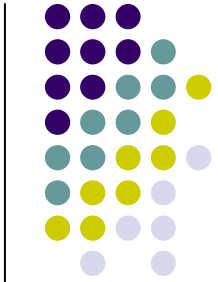
- Select Team
- Draft project charter

Process Capability



Goal is to fit the bell curve in between the LSL and USL limits.

Measure



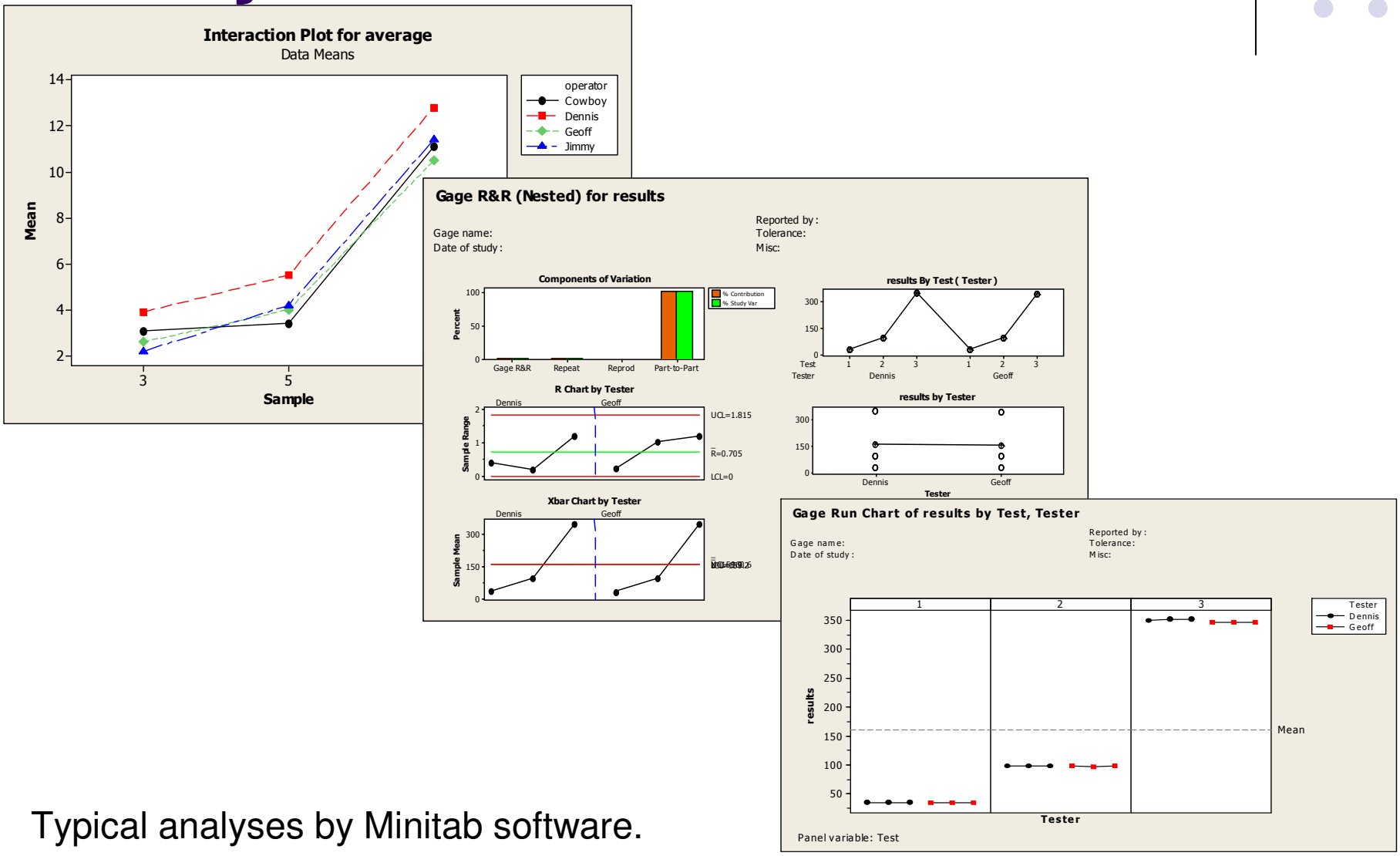
Used Tools

- Evaluate measurement system
- Collect process data
- Baseline capability
- Repeatability & reproducibility

"Leaned" Tools

- Create process map
- Measure process spread
- Short and long term variation
- Cause and effects matrix

Analyze



Typical analyses by Minitab software.

Analyze

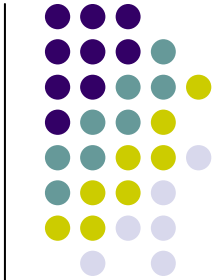
Used Tools

- Analyze process data
- Multi-variable study
- 5 why's
- Negative brainstorming
- Create control plan

"Leaned" Tools

- FMEA
- Regression
- Normality testing
- DOE

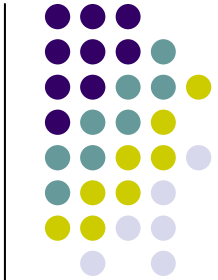
Failure Mode Effect Analysis



Process Step	Key Process Input	Potential Failure Mode	Potential Failure Effects	SEV	Potential Causes	OCC	Current Controls	DET	RPN
Sampling	**Operator**	**Doesn't wait long enough**	**Bad sample**	**9**	**Boiler valve**	**7**	**None**	**9**	**567**
Sampling	**operator**	**Waits too long to run sample**	**Bad analysis**	**7**	**Gets busy**	**8**	**Operator check**	**9**	**504**
Testing	**Operator**	**Wrong reagent**	**Wrong/zero value**	**9**	**Procedure**	**8**	**none**	**7**	**504**
Chemical prep	**Operator**	**Too much added**	**Chemical waste**	**7**	**Procedure**	**7**	**None**	**7**	**343**
Testing	**operator**	**Buret used improperly**	**High hardness**	**9**	**In hurry**	**7**	**None**	**6**	**378**

Example of a step eliminated due to overcomplexity.

Improve



Used Tools

- Generate potential solutions
- Management of Change
- Validate process improvements

"Leaned" Tools

- Model the process
- Use comparisons
- Prioritizations

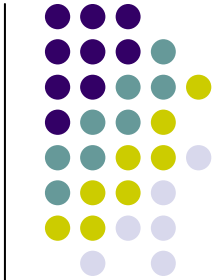
Control

Used Tools

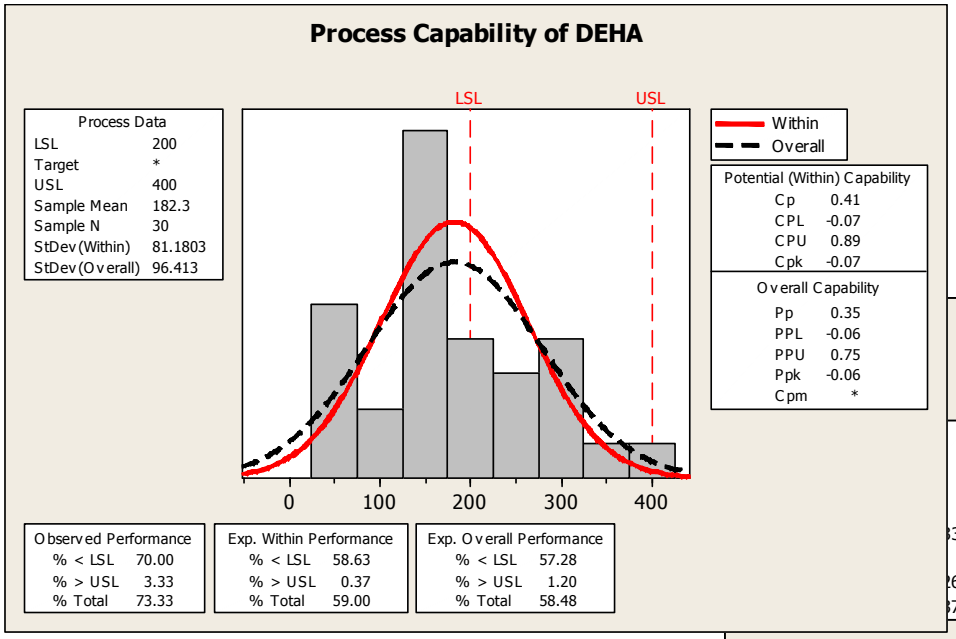
- Validate performance
- “Embed” the solutions
- Quantify the improvement
- Close the project

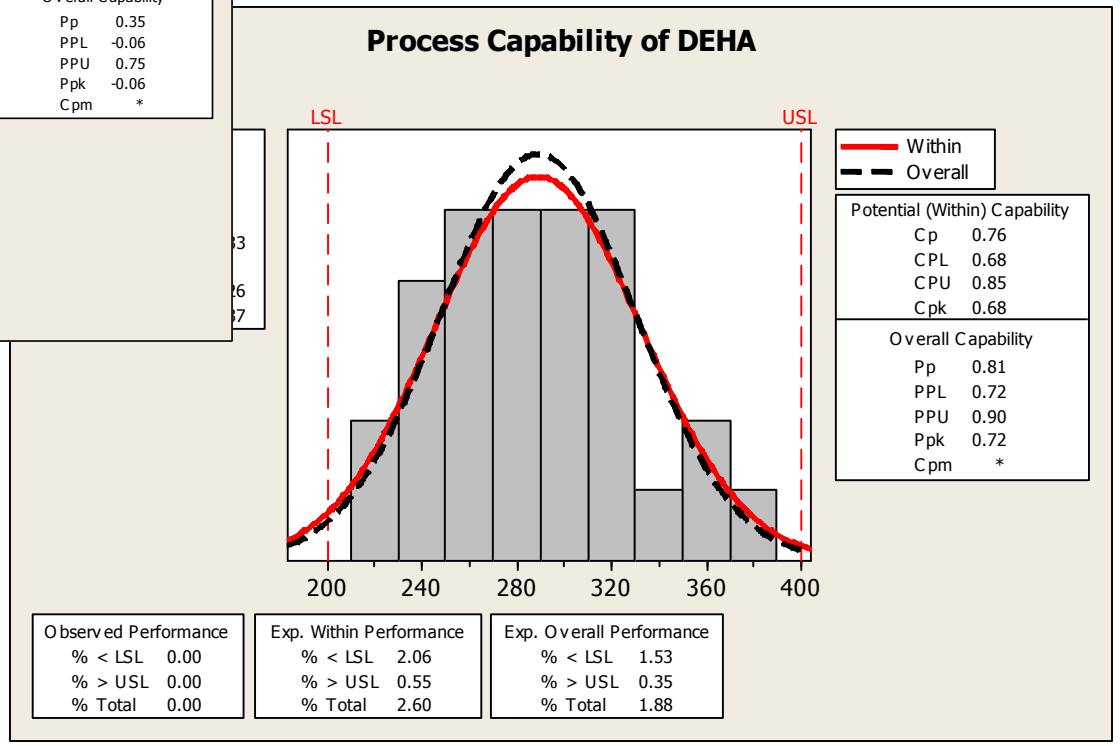
“Leaned” Tools

- I-MR chart
- X bar chart

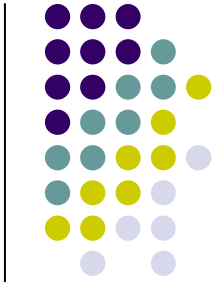


Control Plan



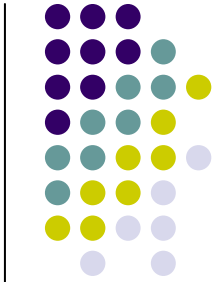


Results



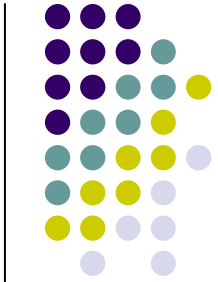
- Maintained AMSE standards while reducing chemical consumption from 22 to 10.4 liters daily.
- Savings of $43,000.
- Reduced project time from 6 months full time to 2.5 months part time.

The Leaning Process



- Cleary identify the scope and magnitude of the project.
- Based on your level of knowledge of the project, determine which six sigma steps are unnecessary.
- Eliminate unnecessary six sigma steps on a project to project basis.
- If in doubt, complete the step.
- Target the reduction from 4-6 to 2-3 months.

Questions?



- References:
  - Six Sigma and Minitab. Quentin Brook. QSB Consulting, 2006.
  - Six Sigma Green Belt 1. Peter Peterka. Six Sigma.us, 2008.