

1.6 Sigma Quality Level (SQL)

MBC 638

Data Analysis and Decision Making

Sigma quality level (SQL) is a quantitative measure of the capability of any process.

Defects per Million Opportunities (DPMO)

- Q: What is a defect?

Defects per Million Opportunities (DPMO)

- Q: What is a defect?
- A: Not meeting customer requirements

Defects per Million Opportunities (DPMO)

- Q: What is a defect?
- A: Not meeting customer requirements
- Sigma quality levels are based on DPMO.

Example: DPMO and SQL



**Example: DPMO and SQL**

1. Defect opportunities per unit: $D = 3$

Example: DPMO and SQL

1. Defect opportunities per unit: $D = 3$
2. Units produced per day: $U = 100$

Example: DPMO and SQL

1. Defect opportunities per unit: $D = 3$
2. Units produced per day: $U = 100$
3. Total possible defects per day: $D \times U = 300$

Example: DPMO and SQL

1. Defect opportunities per unit: $D = 3$
2. Units produced per day: $U = 100$
3. Total possible defects per day: $D \times U = 300$
4. Total actual defects: $A = 20$

Example: DPMO and SQL

1. Defect opportunities per unit: $D = 3$
2. Units produced per day: $U = 100$
3. Total possible defects per day: $D \times U = 300$
4. Total actual defects: $A = 20$
5. Defect-per-opportunity rate: $A \div DU = DPO = 6.7\%$

Example: DPMO and SQL

1. Defect opportunities per unit: $D = 3$
2. Units produced per day: $U = 100$
3. Total possible defects per day: $D \times U = 300$
4. Total actual defects: $A = 20$
5. Defect-per-opportunity rate: $A \div DU = DPO = 6.7\%$
6. Defects per million opportunities (DPMO): $DPO \times 1,000,000 = 67,000$

Example: DPMO and SQL

1. Defect opportunities per unit: $D = 3$
2. Units produced per day: $U = 100$
3. Total possible defects per day: $D \times U = 300$
4. Total actual defects: $A = 20$
5. Defect-per-opportunity rate: $A \div DU = DPO = 6.7\%$
6. Defects per million opportunities (DPMO): $DPO \times 1,000,000 = 67,000$
7. SQL value (from [SQL table](#)) =

DPMO	S.Q.L.	Yield		DPMO	S.Q.L.	Yield		DPMO	S.Q.L.	16 of 20
934,000	0	6.60%		308,000	2	69.20%		6,210	4	99.40%
920,000	0.1	8.00%		274,000	2.1	72.60%		4,660	4.1	99.50%
900,000	0.2	10.00%		242,000	2.2	75.80%		3,460	4.2	99.70%
880,000	0.3	12.00%		212,000	2.3	78.80%		2,550	4.3	99.75%
860,000	0.4	14.00%		184,000	2.4	81.60%		1,860	4.4	99.81%
840,000	0.5	16.00%		158,000	2.5	84.20%		1,350	4.5	99.87%
810,000	0.6	19.00%		135,000	2.6	86.50%		960	4.6	99.90%
780,000	0.7	22.00%		115,000	2.7	88.50%		680	4.7	99.93%
750,000	0.8	25.00%		96,800	2.8	90.30%		480	4.8	99.95%
720,000	0.9	28.00%		80,800	2.9	91.90%		330	4.9	99.97%
690,000	1	31.00%		66,800	3	93.30%		230	5	99.98%
650,000	1.1	35.00%		54,800	3.1	94.50%		150	5.1	99.99%
610,000	1.2	39.00%		44,600	3.2	95.50%		100	5.2	99.99%
570,000	1.3	43.00%		35,900	3.3	96.40%		70	5.3	99.99%
540,000	1.4	46.00%		28,700	3.4	97.10%		40	5.4	99.996%
500,000	1.5	50.00%		22,700	3.5	97.70%		30	5.5	99.997%
460,000	1.6	54.00%		17,800	3.6	98.20%		20	5.6	99.998%
420,000	1.7	58.00%		13,900	3.7	98.60%		10	5.7	99.999%
382,000	1.8	61.80%		10,700	3.8	98.90%		8	5.8	99.999%
344,000	1.9	65.60%		8,190	3.9	99.20%		5	5.9	99.9995%
								3.4	6	99.9997%

SQL Table

DPMO	SQL	Yield
...
135,000	2.6	86.70%
115,000	2.7	88.70%
96,800	2.8	90.30%
80,800	2.9	91.90%
66,800	3	93.30%
54,800	3.1	94.70%
44,600	3.2	95.70%
35,900	3.3	96.40%
28,700	3.4	97.10%
...

Example: DPMO and SQL

1. Defect opportunities per unit: $D = 3$
2. Units produced per day: $U = 100$
3. Total possible defects per day: $D \times U = 300$
4. Total actual defects: $A = 20$
5. Defect-per-opportunity rate: $A \div DU = DPO = 6.7\%$
6. Defects per million opportunities (DPMO): $DPO \times 1,000,000 = 67,000$
7. SQL value (from [SQL table](#)) = 3

Conclusion

- Most companies' processes have an SQL between 1.0 and 2.0.

