How To Calculate DPMO and Sigma Level

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What is DPMO

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In process improvement efforts, defects per million opportunities or DPMO (or nonconformities per million opportunities (NPMO)) is a **measure of process performance.**

A defect can be defined as a non-conformance of a quality characteristic (e.g. strength, width, response time) to its specification.

Why Use Sigma Instead of Percent?

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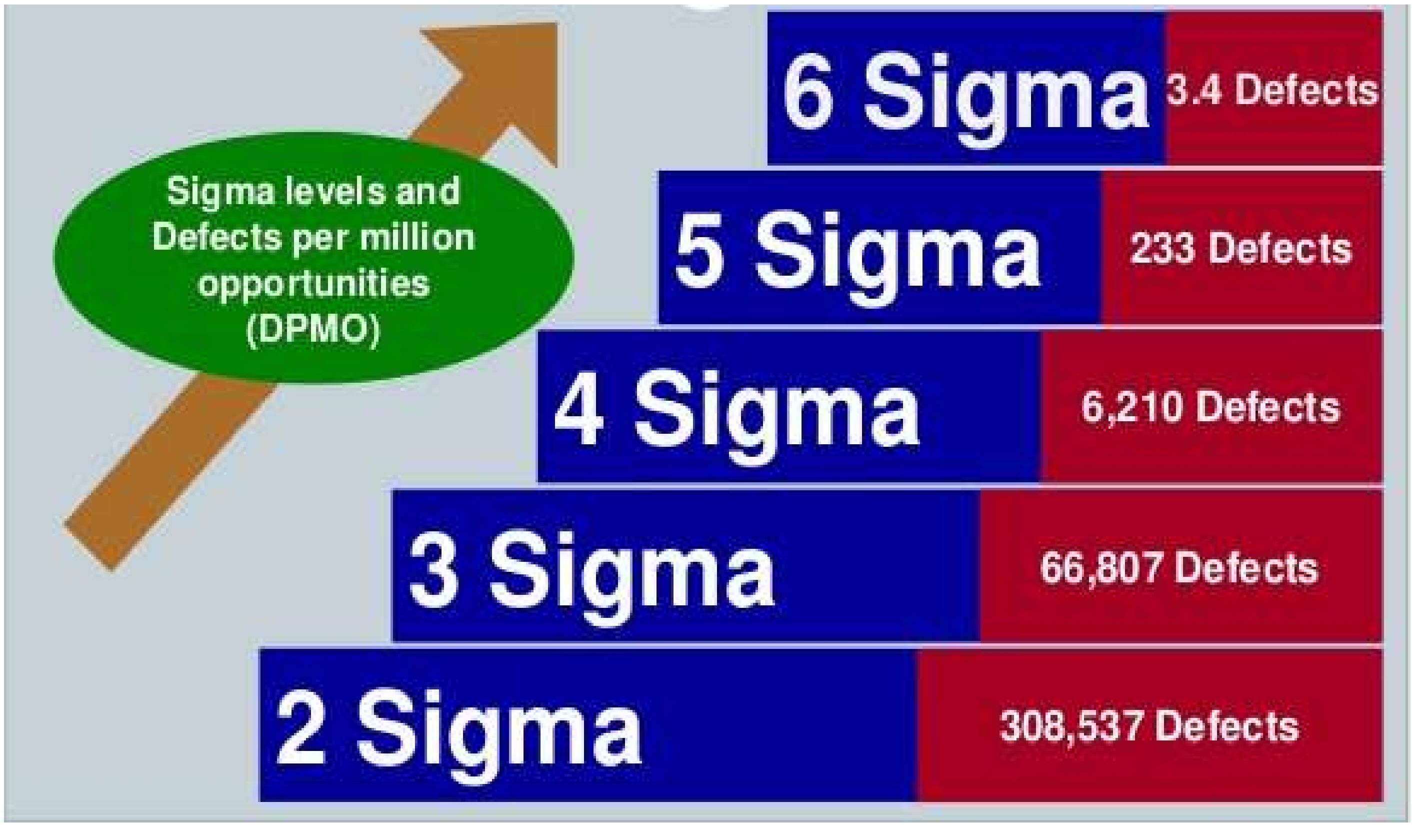

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Measuring in sigma level allows you to know your level of Quality and compare with your competitor and find improvements opportunities

DPMO FORMULA

$$\text{DPMO Formula} = \frac{\text{Total Number of Defects found in Sample}}{\text{(Sample Size x Number of Defects Opportunities per Unit in the Sample)}} \times 1000000$$

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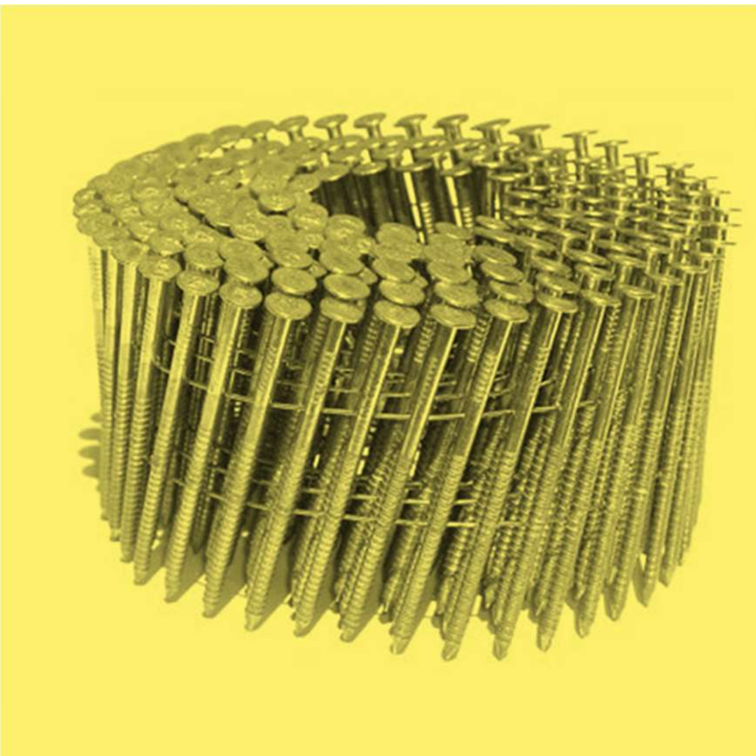
DPMO Example : Nail Production



Nail	Length	Diameter	Plating	Hardness	Material	Defective	# of Defects per nail
Nail #1		X			X	YES	2
Nail #2	X					YES	1
Nail #3						NO	0
Nail #4		X	X	X		YES	3
Nail #5				X	X	YES	2
Nail #6	X	X			X	YES	3
Nail #7	X	X	X	X		YES	4
Nail #8			X	X		YES	2
Nail #9						NO	0
Nail #10				X	X	YES	2

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SUMMARY

Number of Defect (D)	= 19 total defects
Sample Size (U)	= 10 nails
Number of Defect Opportunity (O) (categories of defect types)	= 5 opportunities

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DPMO CALCULATION

Defect (D)	19
Jumlah Unit (U)	10
Oportunity (O)	5
DPMO	=((D/(UxO))x1000000
DPMO	380000

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SIGMA LEVEL FORMULA

Defect (D)	19
Jumlah Unit (U)	10
Oportunity (O)	5
DPMO	=((D/(UxO))x1000000
DPMO	380000
Sigma Level	NORMSINV((1000000-DPMO)/(1000000))+1.5
Sigma Level	1,8

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Conversion Table Sigma Level

Sigma	DPMO	Yield	Sigma	DPMO	Yield	Sigma	DPMO	Yield	Sigma	DPMO	Yield
6.00	3.4	99.99966%	4.50	1350	99.87%	3.00	66807	93.32%	1.50	500000	50.0%
5.95	4.3	99.99957%	4.45	1589	99.84%	2.95	73529	92.65%	1.45	519939	48.0%
5.90	5.4	99.99946%	4.40	1866	99.81%	2.90	80757	91.92%	1.40	539828	46.0%
5.85	6.8	99.99932%	4.35	2186	99.78%	2.85	88508	91.15%	1.35	559618	44.0%
5.80	8.5	99.99915%	4.30	2555	99.74%	2.80	96801	90.32%	1.30	579260	42.1%
5.75	11	99.9989%	4.25	2980	99.70%	2.75	105650	89.44%	1.25	598706	40.1%
5.70	13	99.9987%	4.20	3467	99.65%	2.70	115070	88.49%	1.20	617911	38.2%
5.65	17	99.9983%	4.15	4025	99.60%	2.65	125072	87.49%	1.15	636831	36.3%
5.60	21	99.9979%	4.10	4661	99.53%	2.60	135666	86.43%	1.10	655422	34.5%
5.55	26	99.9974%	4.05	5386	99.46%	2.55	146859	85.31%	1.05	673645	32.6%
5.50	32	99.9968%	4.00	6210	99.38%	2.50	158655	84.13%	1.00	691462	30.9%
5.45	39	99.9961%	3.95	7143	99.29%	2.45	171056	82.9%	0.95	708840	29.1%
5.40	48	99.9952%	3.90	8198	99.18%	2.40	184060	81.6%	0.90	725747	27.4%
5.35	59	99.9941%	3.85	9387	99.06%	2.35	197662	80.2%	0.85	742154	25.8%
5.30	72	99.9928%	3.80	10724	98.93%	2.30	211855	78.8%	0.80	758036	24.2%
5.25	88	99.9912%	3.75	12224	98.78%	2.25	226627	77.3%	0.75	773373	22.7%
5.20	108	99.9892%	3.70	13903	98.61%	2.20	241964	75.8%	0.70	788145	21.2%
5.15	131	99.9869%	3.65	15778	98.42%	2.15	257846	74.2%	0.65	802338	19.8%
5.10	159	99.984%	3.60	17864	98.21%	2.10	274253	72.6%	0.60	815940	18.4%
5.05	193	99.981%	3.55	20182	97.98%	2.05	291160	70.9%	0.55	828944	17.1%
5.00	233	99.977%	3.50	22750	97.72%	2.00	308538	69.1%	0.50	841345	15.9%
4.95	280	99.972%	3.45	25588	97.44%	1.95	326355	67.4%	0.45	853141	14.7%
4.90	337	99.966%	3.40	28716	97.13%	1.90	344578	65.5%	0.40	864334	13.6%
4.85	404	99.960%	3.35	32157	96.78%	1.85	363169	63.7%	0.35	874928	12.5%
4.80	483	99.952%	3.30	35930	96.41%	1.80	382089	61.8%	0.30	884930	11.5%
4.75	577	99.942%	3.25	40059	95.99%	1.75	401294	59.9%	0.25	894350	10.6%
4.70	687	99.931%	3.20	44565	95.54%	1.70	420740	57.9%	0.20	903199	9.7%
4.65	816	99.918%	3.15	49471	95.05%	1.65	440382	56.0%	0.15	911492	8.9%
4.60	968	99.903%	3.10	54799	94.52%	1.60	460172	54.0%	0.10	919243	8.1%
4.55	1144	99.886%	3.05	60571	93.94%	1.55	480061	52.0%	0.05	926471	7.4%

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