Count of Product ID
10K

Average of Tool wear...
107.95

Min of Tool wear [min]
0

Max of Tool wear [min]
253

Machine failure
0 1

Type
All

Sum of Machine failure
339

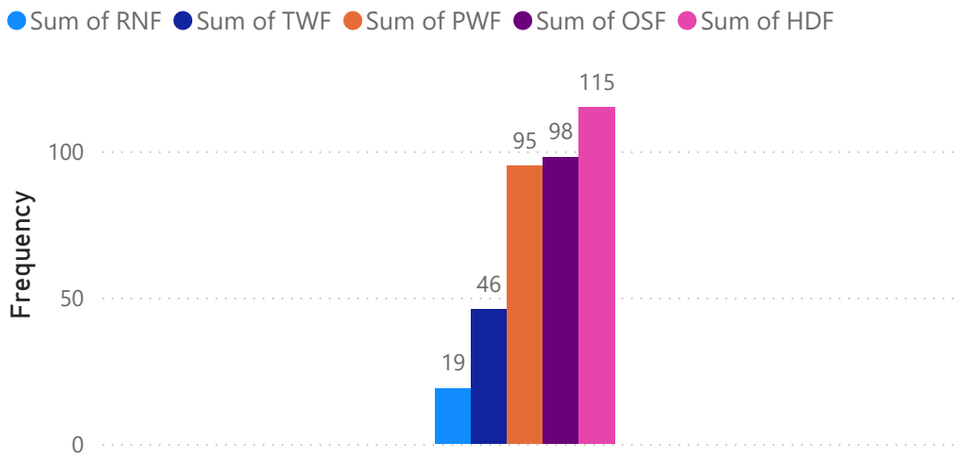
Most Common Failure...
HDF

Overall Failure Rate (%)
3.39

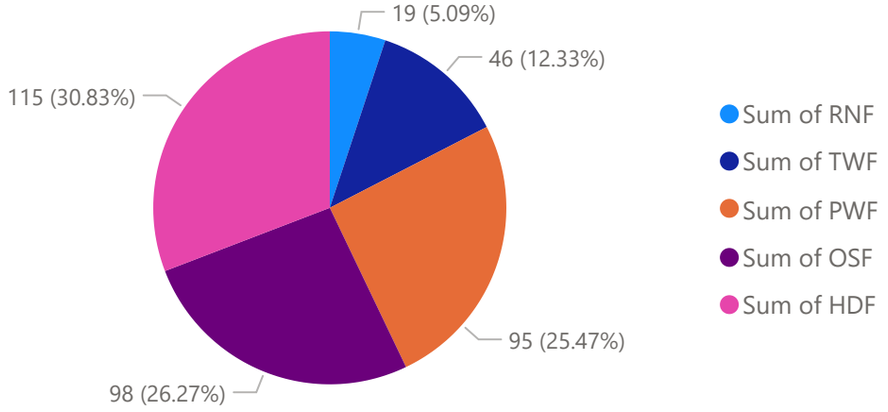
MTBF
29.50

Availability Rate
0.97

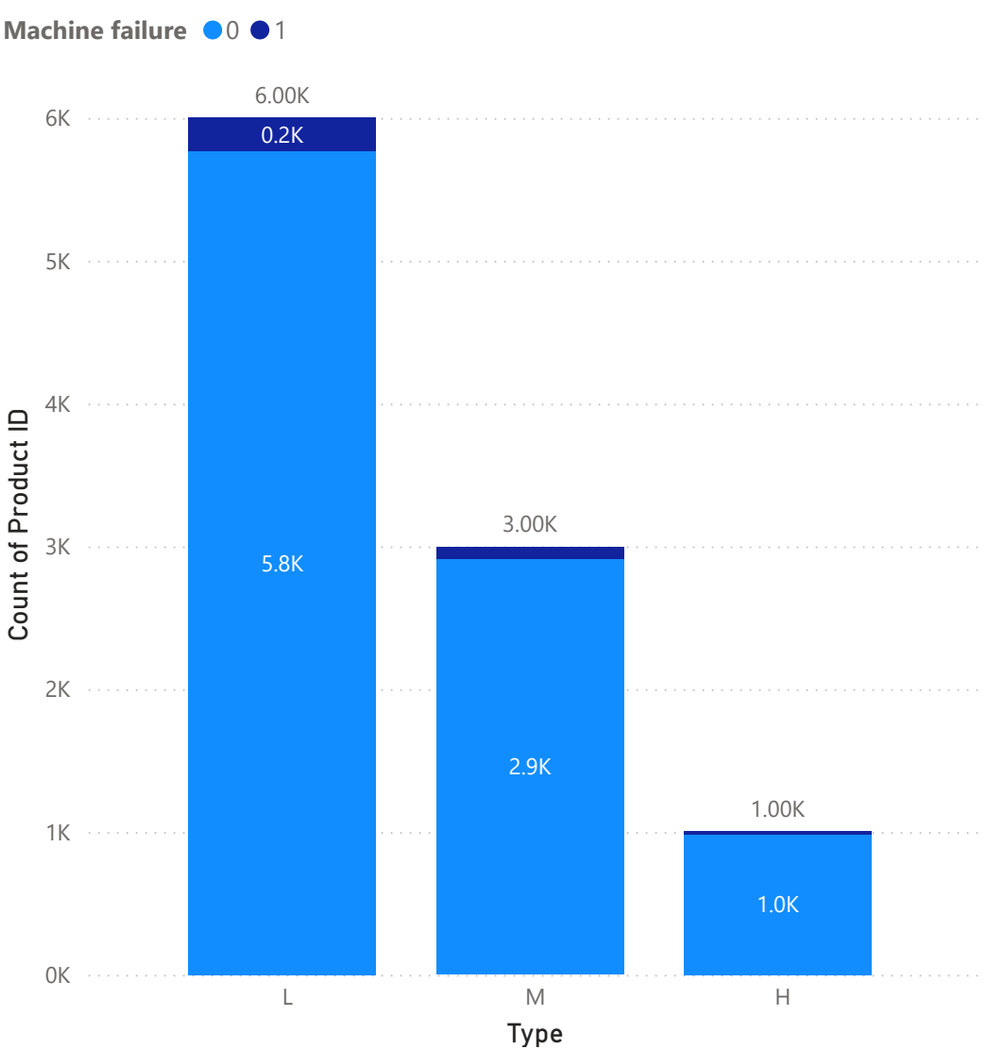
Failure Type Distribution



Failure Type Distribution



Frequency of Product by Type



Product ID	Type	Tool wear [min]	Risk Score	Risk Level
H29424	H	24	9.49	Low
H29425	H	29	11.46	Low
H29432	H	50	19.76	Low
H29434	H	58	22.92	Low
H29441	H	77	30.43	Low
H29452	H	106	41.90	Medium
H29457	H	120	47.43	Medium
H29462	H	135	53.36	Medium
H29466	H	147	58.10	Medium
H29481	H	184	72.73	High
H29494	H	4	1.58	Low
H29500	H	20	7.91	Low
H29522	H	75	29.64	Low
H29525	H	84	33.20	Low
H29550	H	143	56.52	Medium
H29552	H	150	59.29	Medium
H29557	H	164	64.82	High
H29560	H	174	68.77	High
H29569	H	198	78.26	High
H29571	H	206	81.42	Critical
H29580	H	10	3.95	Low
H29581	H	15	5.93	Low
H29595	H	49	19.37	Low
H29606	H	76	30.04	Low
H29607	H	81	32.02	Low
H29610	H	91	35.97	Low
H29626	H	130	51.38	Medium
H29635	H	153	60.47	High
H29680	H	37	14.62	Low
H29682	H	44	17.39	Low
H29684	H	51	20.16	Low
Total			**42.67**	**Medium**

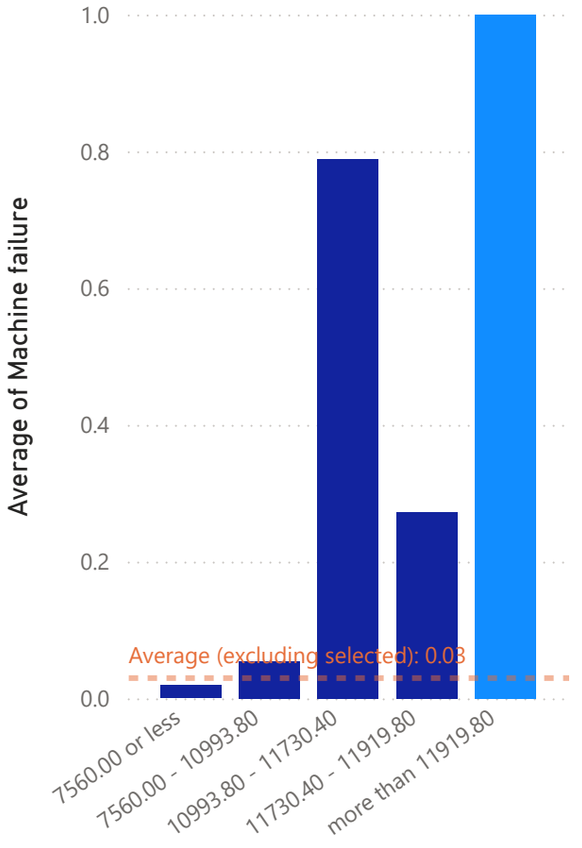
Key influencers | **Top segments**

What influences Machine failure to Increase ?

When... ....the average of Machine failure increases by

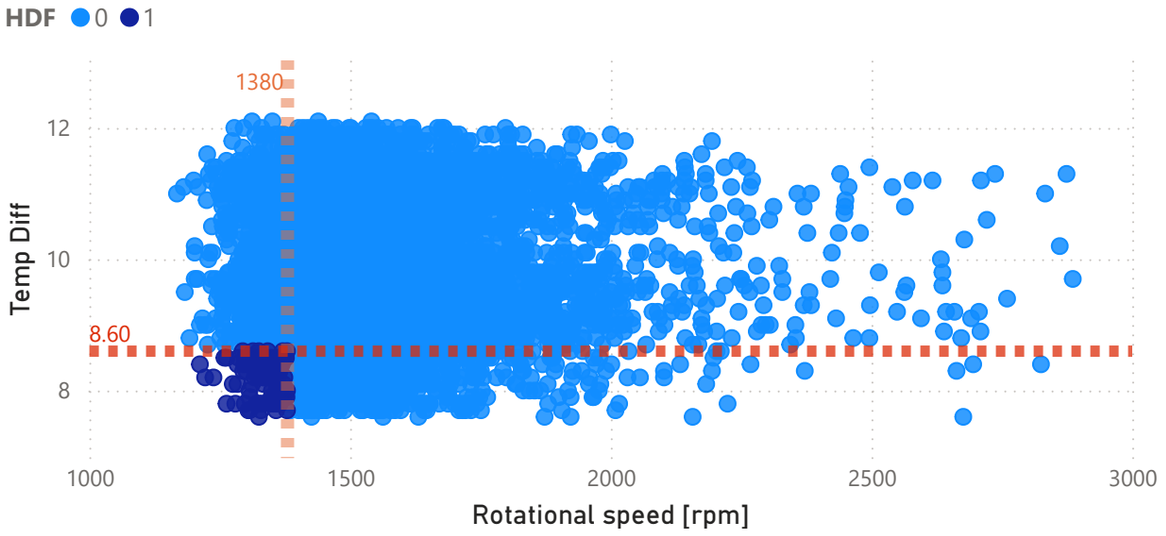
- **Tool Wear x Torque (min nM) is more than 11919.80** — 0.97
- Average of Torque [Nm] is 13 or less — 0.87
- Average of Torque [Nm] is more than 64.9 — 0.8
- Tool Wear x Torque (min nM) is 10993.80 - 11730.40 — 0.76
- Average of Rotational speed [rpm] is more than 2465 — 0.75
- Temp Diff is 8.60 or less — 0.15
- Average of Rotational speed [rpm] is 1381 or less — 0.15
- Average of Torque [Nm] is 53.5 - 64.9 — 0.13

← Machine failure is more likely to increase when Tool Wear x Torque (min nM) is more than 11919.80 than otherwise (on average).



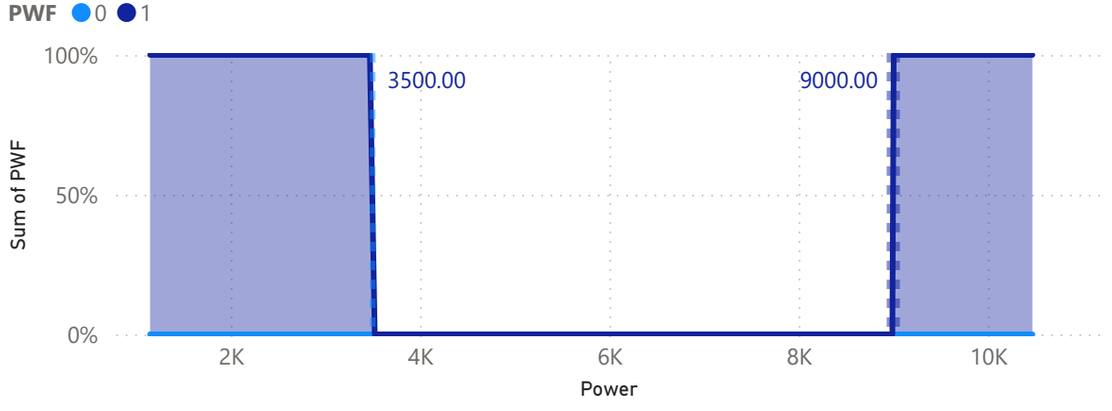
☐ Only show values that are influencers

HDF Distribution as per Temp Diff and Rotational speed [rpm]



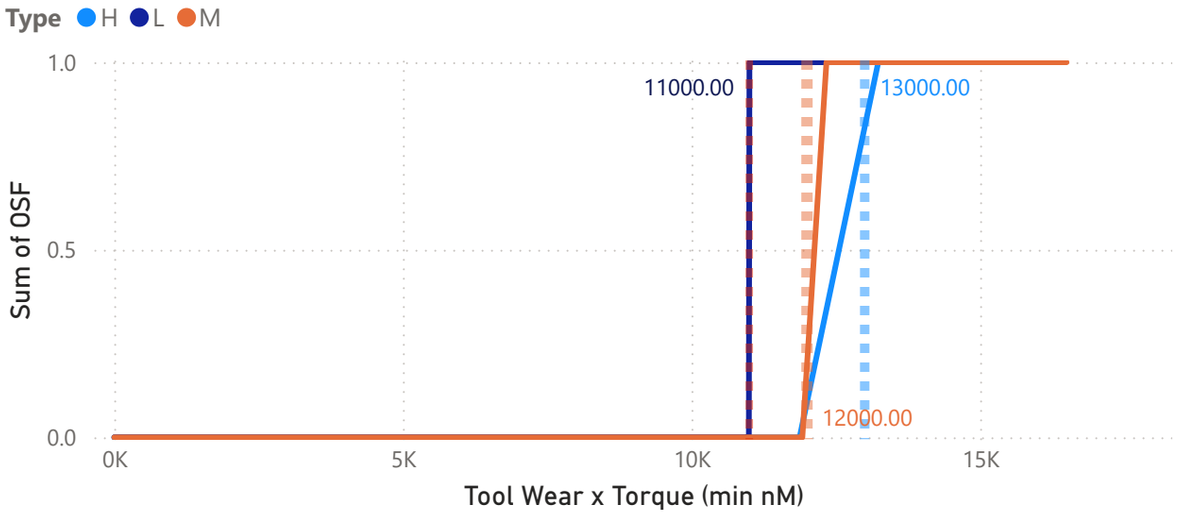
Heat dissipation failure (HDF): heat dissipation causes a process failure, if the difference between air- and process temperature is below 8.6 K and the tools rotational speed is below 1380 rpm.

PWF Distribution against Power (W)



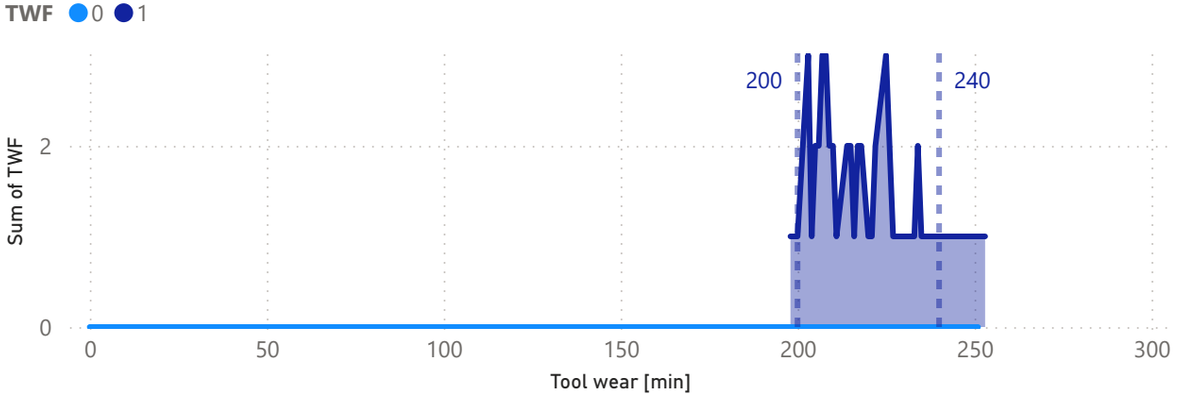
Power failure (PWF): the product of torque and rotational speed (in rad/s) equals the power required for the process. If this power is below 3500 W or above 9000 W, the process fails,

OSF distribution against Tool Wear x Torque (min nM)



Overstrain failure (OSF): if the product of tool wear and torque exceeds 11,000 minNm for the L product variant (12,000 M, 13,000 H), the process fails due to overstrain.

TWF Distribution by Tool wear [min]



Tool wear failure (TWF): the tool will be replaced of fail at a randomly selected tool wear time between 200 - 240 mins (120 times in our dataset).

Failure Mechanism:
Excessive tool wear → Reduced cutting efficiency → Increased torque demand → Higher temperatures → Heat dissipation failures (HDF) → Cascading to other failure types

Recommended Actions
Immediate (Next 24h):
1. **Shutdown** all machines with tool wear >200min
2. **Replace tools** on critical risk machines
3. **Adjust operating parameters** for machines near thresholds

Short-term (Next Week):
1. **Implement predictive maintenance** schedule at 180 min tool wear
2. **Retrain operators** on torque and RPM optimal ranges
3. **Install temperature monitoring** alerts for temp diff <8.60

Long-term:
1. **Preventive maintenance** at 150min tool wear
2. **Parameter optimization** to stay within 3566.23 - 8990.4 W
3. **Cooling system upgrade** for better heat dissipation