

CASE STUDY 101

(DISTORTION CONTROL OF GEARS WITH QUENCHING OIL HIQUENCH MT2100)



PROFILE OF COMPANY:

Company specialised in heat treatment in eastern India



OPERATING/ APPLICATION DETAILS

Description	Specification
Material	Helical Gear
Material Grade	20MnCr5
Preheat	450 °C
Carburising	930°C/ 10 Hrs
Hardening Temp.	820 °C/ 1Hr
Case Depth	0.9-1.2 mm
Surface Hardness	60-62 HRc
Core Hardness	30-40 HRc
Quenchant Temp.	120 °C/ 30 Min
Agitation	300 RPM 10 min all 4 agitator, 20 minute 2 agitator 400 rpm
Tempering Temperature	150 °C/ 2 Hrs
Quenchant Tank Capacity	5800 litres



OBJECTIVE OF TRIALS

Reduce ID contraction of Helical Gears after Carburising and Hardening.



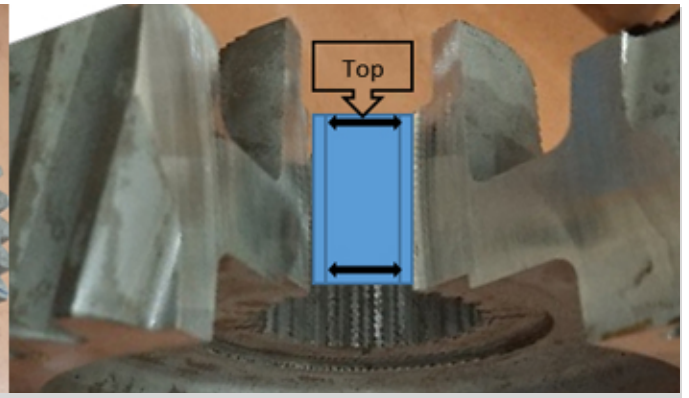
OBSERVATIONS:

Trial Details	Hardness (HRc)	Top MOR (46.902-46.994) mm	Bottom MOR mm	Taper microns (100 Max)	Remark
Agitation 400 RPM/820 °C	61-62	46.88	47.0	120	Not Ok
Agitation 200 RPM/820 °C	60-61	46.91	47.0	90	OK
Agitation 300 RPM/810 °C	60-61	46.91	47.0	90	OK
Agitation 250 RPM/810 °C	60-61	46.91	47.0	90	OK

1. At higher agitation surface hardness was higher side but the ID contraction observed more than 100 micron.
2. Further reduction in agitation from 300 to 250 RPM not shown any improvement in distortion control.
3. Furnace design not allowed to raise the oil temp above 120 Degree.



COMPONENT DETAILS



PRODUCT RECOMMENDED: HIQUENCH MT2100

TRIAL CONCLUSION



Required surface Hardness, core hardness and microstructure of gear achieved in trials.



Result achieved even with furnace design constraint like quench oil temperature were limited to 120 °C and Tank capacity- charge weight to quenching oil volume was 1:6



Distortion of gear was controlled by reducing agitation and hardening temperature.