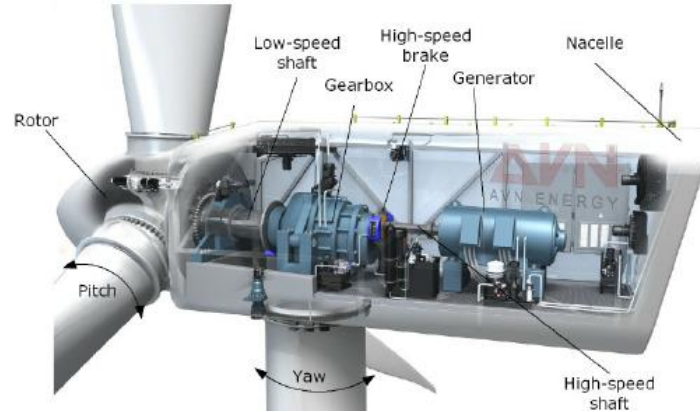
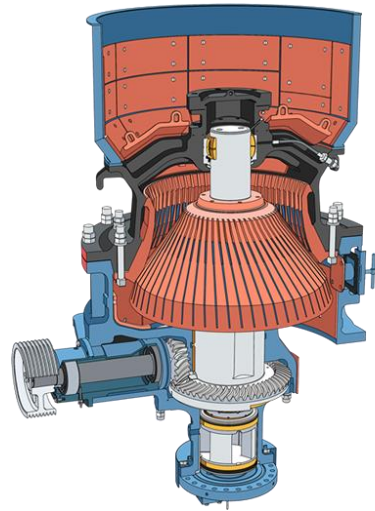
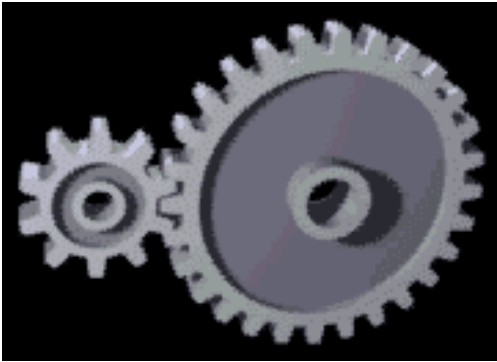


Lubricant Application: Gear

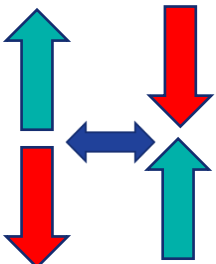
Why Gears are Popular?



Torque

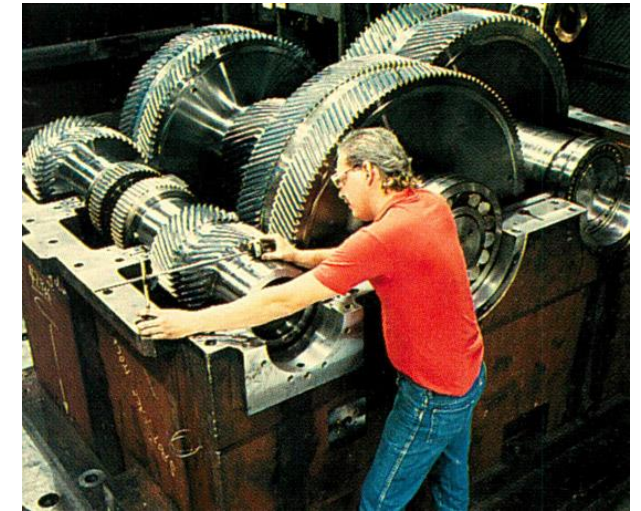
Speed

Direction :
Change

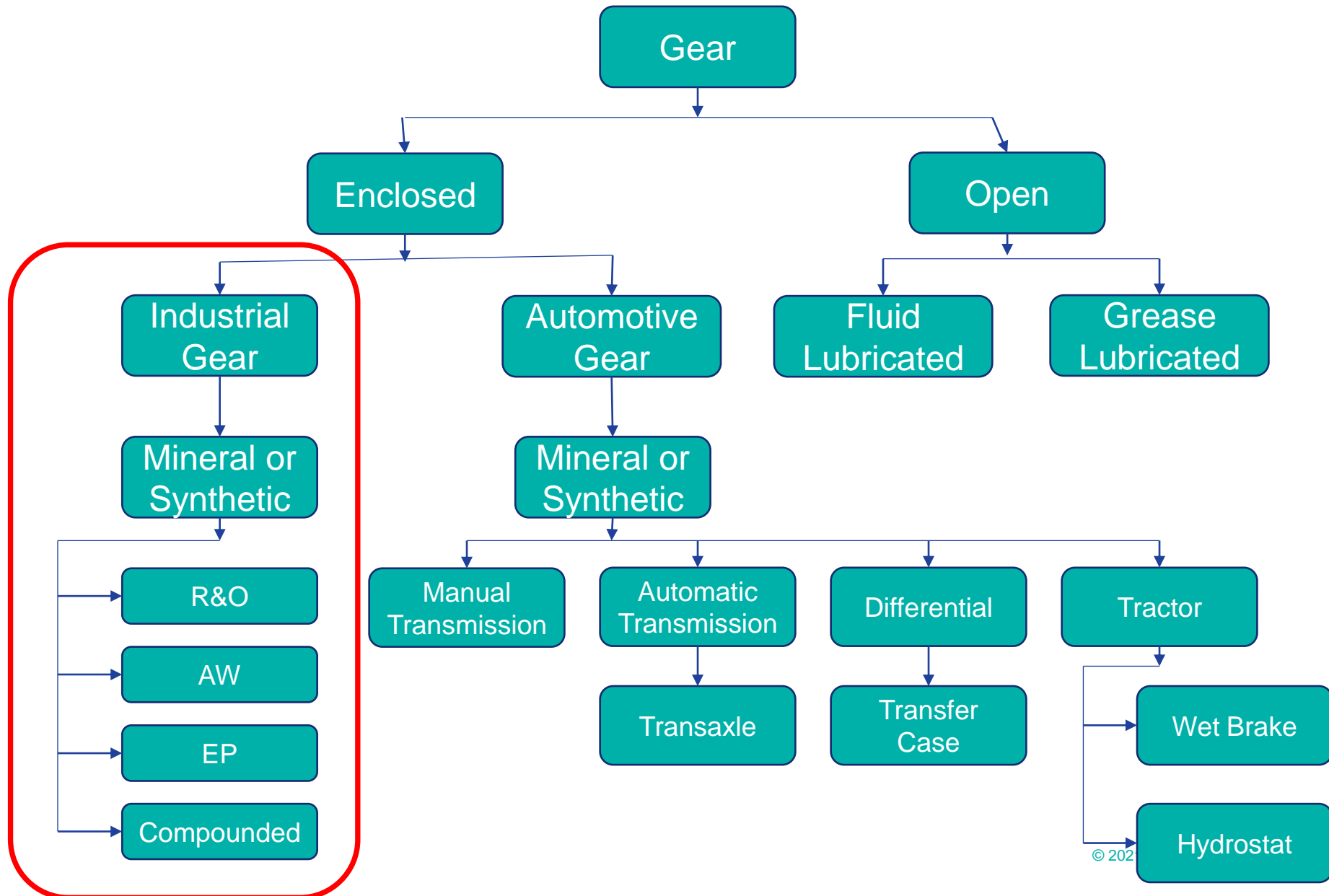


Advantages of Gear Systems:

- No slip
- Flexibility: High load/High Speed
- Compact



Family of Gear



Open Gear Vs Enclosed Gear

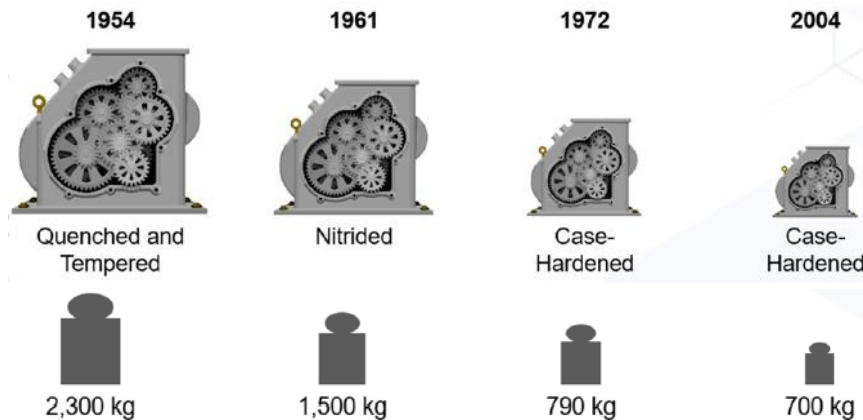
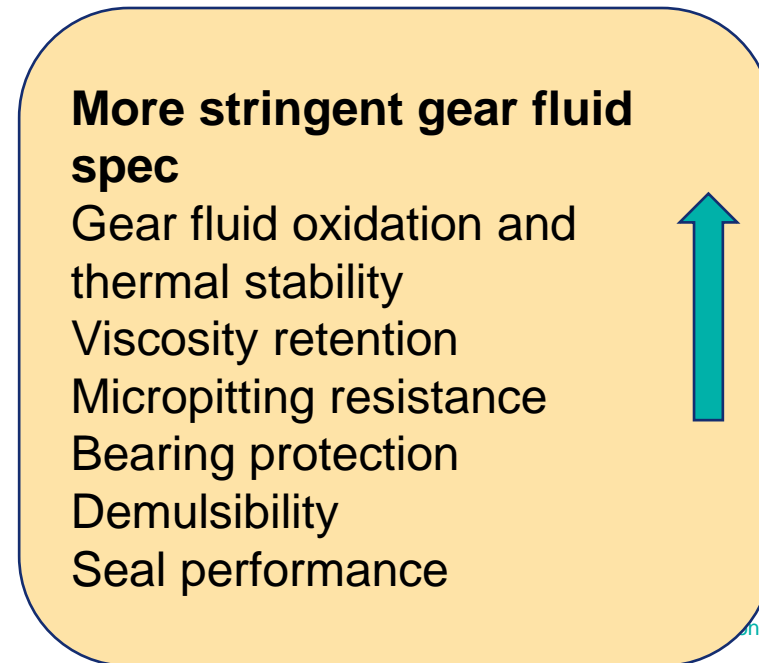
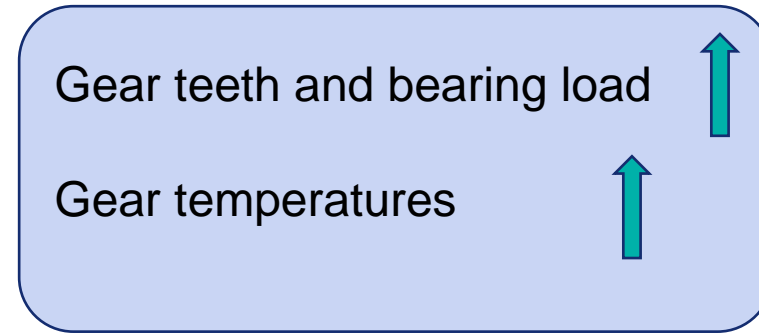
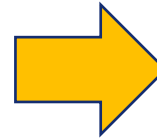
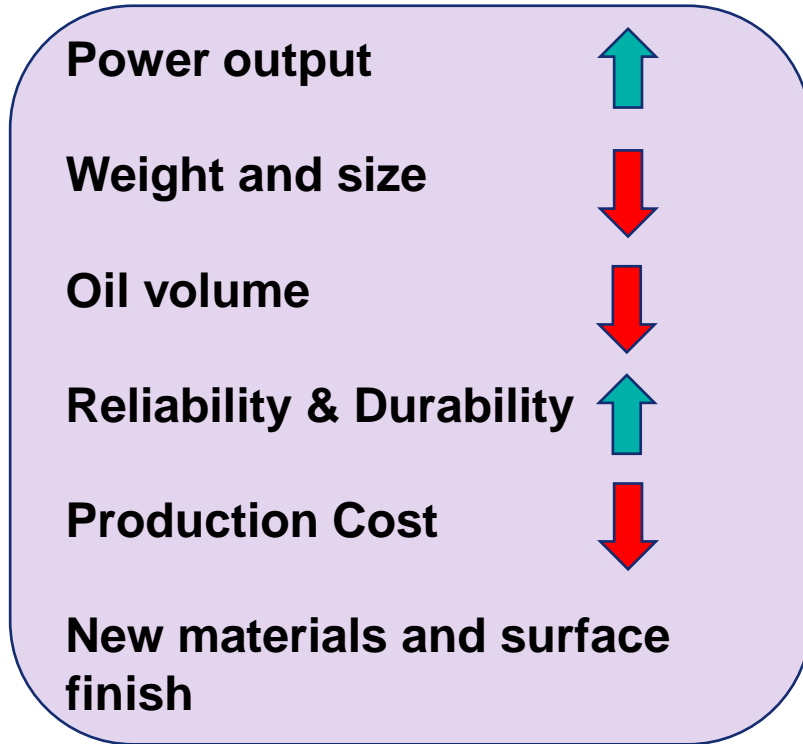


- Extremely high load at slow speed
- Extremely large size and part of the rotating equipment
- Harsh environment and heavy load
- Grease type or very high viscosity oil with EP



- Stand alone equipment driven by external power source
- Transmit speed and torque to other another device
- Much cleaner environment and lower maintenance cost
- High temp and pressure
- Requires oxidation stability, micropitting and extreme pressure

Current trend of gear systems



Functions of Gear Fluid



Protect Against Wear

- Load carrying
- Anti-wear/EP
- Anti-friction
- Viscosity retention

Cool Down the system

- Good thermal capacity & conductivity

Protect against corrosion

- Corrosion control
- Material compatibility

Keep the system clean

- Thermal and oxidative stability
- Hydrolytic stability/water tolerance
- Cleanliness & filterability
- Demulsibility



Major Issues with Industrial Gear



Micropitting



Gear Teeth Failure



Macropitting

Four common factors contribute to gear failure and reduce gear life:

Load
Environment
Speed
Contamination
(LETS-C)



Open

PETRONAS Gear Fluid Solutions

Product Name (New)	Product Name (Old)	Viscosity Grade	Base oil type	Applications
PETRONAS Gear Syn PAG	Gear Syn PGS	150, 220, 320, 460, 680	Synthetic PAG	Spur, Bevel, Helical, Planetary, Industrial worm
PETRONAS Gear Syn PAO	Gear Syn MPC	150, 220, 320, 460, 680	Synthetic PAO	Spur, Bevel, Helical, Planetary
PETRONAS Gear Syn IG	Gear Syn IG	150 to 1000	Synthetic PAO	Enclosed gear, bearings and circulation
PETRONAS Gear Syn	N/A	150, 220, 320, 460, 680	Synthetic performance	Spur, Bevel, Helical, Planetary
PETRONAS Gear FL	N/A	150, 220, 320, 460, 680	Mineral	Spur, Bevel, Helical, Planetary
PETRONAS Gear MEP	Gear MEP	68, 100, 150, 220, 320, 460, 680, 1000	Mineral	Spur, Bevel, Helical, Planetary
PETRONAS Circula	Gear STR	150, 220, 320, 460	Mineral	Spur and helical gear not require EP

List of approvals and technical specifications

Standard (OEM and Industry)	Gear Syn PAG	Gear Syn PAO	Gear FL	Gear MEP
SIEMENS MD (FLENDER) (OEM)	M	A	A	
FIVES CINCINNATI (OEM)			A	A
DAVID BROWN (OEM)	M			M
GM LS2 EP GEAR (OEM)				M
DIN 51517 PART III (industry.std)	M	M	M	M
AGMA 9005 E02 (industry.std)		M	M	M
US Steel 224 (industry.std)		M	M	M

A : Formal Approval

M: Meeting specification

Comparison between mineral and synthetic gear fluid

	Mineral based with EP	Synthetic PAO with EP
Total oil used	500 L x 200 Units x 3 = 300,000 Litre	500 L x 200 Units x 1 = 100,000 Litre
Relative oil life	1	3
Price per litre (RM)	8.00	40.00
Total Amount Spent (RM)	2,400,000.00	4,000,000.00
Relative Total Amount Spent	1	1.67
Other Cost		
Downtime (Estimate 2 hours per unit)	200 units x 2 hours x 3 times = 1,200 hours = 50 days	200 units x 2 hours x 1 time = 400 hours = 17 days
	33 days of extra Uptime	
Manpower (oil change, commissioning) = RM 80.00 per hour	1,200 hours x RM 80.00 = RM 96,000.00	400 hours x RM 80.00 = RM 32,000.00
	RM 64,000.00 savings	

Energy savings, longer components lifespan, reliability

Proof of Performance of PETRONAS Gear Syn MPC 320



100% ODI
extension!



- Customer Name: CMS Cement Sdn. Bhd.
- Equipment Name: Belt Bucket Elevator
- Gearbox brand and model: SIEMENS Flender B3DH09D
- Field trial duration: One (1) year
- Product Name: PETRONAS Gear Syn MPC 320 (fully synthetic PAO)
- Benefit: Extended oil drain interval from 6 months to 1 year (100%)

“The performance of PETRONAS Gear Syn MPC 320 is very good. Despite after one year of operation, the oil analysis has shown that the oil is reliable and may help to extend oil drain interval as compared to mineral-based gear oil. We plan to upgrade all mineral based gear oil to PETRONAS fully synthetic gear oil”.

– Mr. Dannis Poget (CMS Cement)

