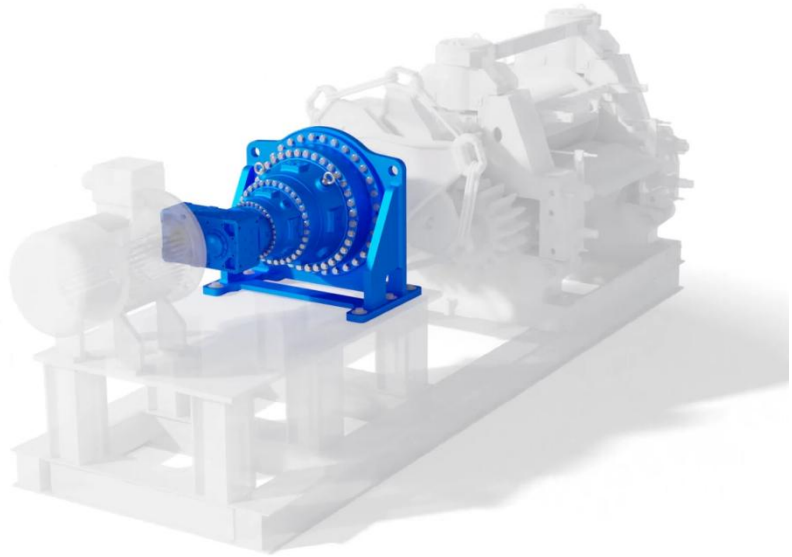
16,000 TCD Gearbox Selection Technical Proposal

Selection Technical Proposal



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1. Project Background & Core Operating Parameters

This proposal is for the capacity upgrade of a **16,000 TCD ultra-large sugar mill crushing line**, based on prime mover and process specifications. Core parameters are as follows:

- Prime mover power: **1,400 kW**
- Output speed: **6 rpm**
- Basic working torque: **2,228 kN·m**
- Service Factor (SF): **≥ 2.5** for continuous heavy-duty operation

2. Precise Gearbox Selection (P3P7725)

In accordance with industry selection standards:

- Selection requirement: **Maximum output torque > 4,456 kN·m**
- Safety Factor (fs): Capable of withstanding instantaneous shock loads ≥ **200% of rated torque**, with peak shocks ≥ **15 times per hour**, no permanent mechanical damage after shocks.

2.1 Instantaneous Extreme Shock Calculation

- Basic working torque: **2,228 kN·m**
- 200% instantaneous load: **4,456 kN·m**

2.2 Safety Factor Verification (Industry Standard)

Formula: $\mathbf{P_n \geq P_1 \times f_1 \times f_2 \times f_3}$

Coefficient	Basis	Value
Machine coefficient f_1	Sugarcane milling (≥10h operation)	1.7
Prime mover coefficient f_2	Turbine / motor drive	1.0
Load characteristic coefficient f_3	Shock load, 15 peaks/h	0.95

- Calculated power: P_n = 1,400 × 1.7 × 1.0 × 0.95 = **2,261 kW**
- Required output torque: T_{2r} = 9.55 × (2,261 ÷ 6) ≈ **3,598 kN·m**

Selection principle:
Maximum output torque must cover both **3,598 kN·m (rated demand)** and **4,456 kN·m (200% shock)**.

2.3 Model Comparison

Model	Rated Torque (kN·m)	Max Torque (kN·m)	Evaluation
P3P4650	~~2,800~~	4,650	Fails 2.5× SF (5,570 kN·m); only meets 200% shock; insufficient rated torque & margin.
P3P5645	~~3,200~~	5,645	Meets 2.5× SF and shock requirements; critical for rated torque (3,598 kN·m); economical minimum.
P3P7725	**3,800**	**7,725**	STRONGLY RECOMMENDED. Extra torque reserve, superior fatigue resistance, long service life. Perfect for 16,000 TCD lines.

2.4 Final Selection Recommendation

- Strict budget: Minimum **WGT P3P5645**
- High reliability / long life priority: **WGT P3P7725** (Best for 16,000 TCD)

3. Core Advantages of P3P7725

1. **Excellent shock resistance margin**

Max torque 7,725 kN·m withstands frequent 200% instantaneous shocks, protects drivetrain in extreme jamming.

2. **Continuous operation for ultra-large lines**

Ample torque reserve reduces tooth stress and fatigue damage, ensuring **zero unplanned downtime** during crushing season.

3. **Economic benefits from high safety margin**

Slightly higher initial investment, but longer life, less maintenance, stronger overload capacity, and higher **total ROI**.

4. Technical Configuration of P3P7725

4.1 Core Parameters

Item	Specification
Model	P3P7725
Rated output torque	3,800 kN·m (> 3,598; > 2,228 kN·m)
Max output torque	7,725 kN·m (> 5,570; > 4,456 kN·m)
Transmission efficiency	≥ 96%
Gear accuracy	ISO 1328 Grade 5
Strength standard	ISO 6336
Inspection windows	Dedicated per gear stage

4.2 Key Component Materials

Component	Material	Description
Sun / Planet / Ring gear	18CrNiMo7-6 carburized & quenched alloy steel	High strength for heavy shock loads
Planet carrier	ZG35CrMo / QT700-2	High rigidity, anti-alternating load
Input / output shaft	42CrMo (upgrade to 34CrNiMo6 recommended)	Higher core strength & fatigue margin
Housing	QT600-3 / welded Q355B	High rigidity, good vibration damping
Bearing	SKF spherical roller bearings	Ball bearings prohibited as required
Seal	Double-lip FKM oil seal	Oil & heat resistant for oil lubrication
Fasteners	Grade 12.9 high-strength alloy steel	High preload, anti-loosening

5. Lubrication System Configuration

5.1 Lubricating Oil Specification

Item	Specification
Type	Heavy-duty extreme pressure industrial gear oil CKD (DIN 51517-3 CLP / API GL-5)
Viscosity grade	ISO VG 320 (ultra-low speed heavy-duty)
Extreme pressure	Timken OK ≥60 lbs; Four-ball weld load ≥300 kg
Cleanliness	ISO 4406 18/15
Operating temp	40–60 °C

5.2 Oil Station (XYZ-270GZ)

Parameter	Specification
Model	XYZ-270GZ
Nominal flow	270 L/min
Working pressure	≤ 0.4 MPa
Supply temp	40 ± 3 °C
Filtration accuracy	0.08–0.12 mm (80–120 μm)
Filter area	≥ 0.6 m² (duplex filter)
Pump motor	9 kW × 2 (1 duty, 1 standby)
Cooling	≥ 30 m² shell-and-tube water cooling
Heating power	27 kW
Oil tank volume	10 m³

Parameter	Specification
Supply pipe	DN80
Return pipe	DN150
Water pipe	DN100
Control	PLC automatic control, remote signal interface
Protection	Pressure / temp / level / differential pressure alarm & interlock

6. Quality Documentation & Acceptance Standards

6.1 Delivery Documents

- Material & heat treatment certificates: material reports, HRC hardness, carburized depth
- Bearing original certificates: SKF authentic confirmation
- Lubricant technical documents: TDS, third-party test reports
- Factory test report: no-load running, temperature rise, vibration data
- 3D model + 2D drawings: STEP/IGES, DWG
- Installation & maintenance manual: lubrication, maintenance, spare parts list

6.2 Acceptance Standards

- Noise: ≤ 85 dB(A)
- Vibration: ≤ 4.5 mm/s
- Oil temperature: ≤ 60 °C under stable operation
- Leakage: No leakage on entire unit
- Continuous running: 72 hours without abnormality

7. Selection Conclusion

It is recommended to select **WGT P3P7725 heavy-duty high-torque planetary gearbox**.
This model precisely matches the 16,000 TCD line, complies with all industry standards, and is the **optimal configuration** for long-term stable production and capacity targets.

8. Physical Pictures

- Planetary Gearbox P3P7725

- Oil Lubrication Station XYZ-270GZ