2650CX
Hybrid Shovel
Product Overview

<table>
<thead>
<tr>
<th>Machine overview</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating weight</td>
<td>817,889 kg</td>
</tr>
<tr>
<td></td>
<td>1,803,134 lbs</td>
</tr>
<tr>
<td>Standard track pads</td>
<td>1626 mm</td>
</tr>
<tr>
<td></td>
<td>64 in.</td>
</tr>
<tr>
<td>Ground bearing pressure</td>
<td>29.6 N/cm²</td>
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<tr>
<td></td>
<td>43 PSI</td>
</tr>
<tr>
<td>Engine output</td>
<td>2,386 kW</td>
</tr>
<tr>
<td></td>
<td>3200 HP</td>
</tr>
<tr>
<td>Bucket capacity @ 1.9 t/m³</td>
<td>31.1 m³</td>
</tr>
<tr>
<td></td>
<td>40.7 yd³</td>
</tr>
<tr>
<td>Rated suspended load</td>
<td>127.5 mt</td>
</tr>
</tbody>
</table>
|                                         | 140.5 st
Who we are:
Since 1921, Komatsu has stood for unrivaled quality and reliability. Our enduring global success stems from the principles of our founder, Meitaro Takeuchi, who envisioned a sustainable future built through globalization, quality first, technology innovation and talent development. These defining principles, along with an emphasis on safety and compliance, remain part of our Komatsu DNA. With each brand and company added to the Komatsu family, we expand our capabilities, leveraging our global teams to push beyond what can be done and create what can be imagined. We believe partnering directly with our stakeholders and being in the workplace (gemba) is the best way to gain insight into their challenges, win their trust and develop cutting-edge solutions.

What we do:
Komatsu is an indispensable partner to the mining, forestry, industrial and construction industries that maximizes value for customers through innovative solutions. With a full line of products supported by our advanced IoT technologies and global service network, we help customers safely and sustainably optimize their operations. Our Komatsu, P&H, Joy and Montabert equipment and services are used to extract fundamental minerals and develop modern infrastructure.

Equipped for the surface. Designed for your bottom line.

The P&H 2650CX hybrid shovel leverages the reliability and productivity expected from the P&H brand with the added benefits of selectivity and mobility. The result is a hybrid built for reliability and maximum efficiency, equipped with game-changing innovations that will redefine market expectations for cost effectiveness. It is a highly-versatile loading tool that offers up to a 15% TCO (Total Cost of Ownership) advantage over traditional hydraulic excavators, due to its reduced operating costs.

This advantage is enabled in large part by our patented SR Hybrid Drive system’s unique ability to capture regenerated energy to utilize in the machine’s electrically controlled motions, which can reduce fuel consumption by as much as 25%.

The 2650CX further reduces operating costs through advanced design and state-of-the-art technology features that combine to deliver up to a 3% availability advantage and up to a 10% reduction in maintenance and repair costs.

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How does the SR Hybrid Drive system work?

During braking, the SR motors become generators, transferring energy back into the SR drives. The SR drives use that regenerated energy to turn the engine SR generator into a motor. With the generator now acting as a motor, it:

- Supplies energy to satisfy parasitic / working loads (primarily hydraulics)
- Supplies energy to satisfy engine losses
- Shuts fuel supply off
- Increases the engine drive train speed (mass of the engine drive train acts as a flywheel for stored energy)
- Sends any remaining excess energy to resistor grids
- Throughout the entire process, the engine experiences 0% load and zero fuel usage

Fuel is cut off for an appreciable amount of time during the shovel load cycle, which significantly reduces fuel consumption and 0% engine load during this time also increases the useful life of the engine.

In addition to fuel savings, the SR Hybrid Drive system also offers significant savings in terms of maintenance costs. The SR motors and generators have no commutator, brushes or rotor windings to repair or replace.
2650CX key features and benefits

Safety
- Fixed boom/handle attachment configuration provides extended reach and optimal height clearance to safely load ultra class haul trucks
- Cab is equipped with features that contribute to a safer and more productive operator experience:
  - Ergonomic controls and overall cab layout
  - Intuitive displays
  - Comfortable seat configuration
- High visibility interior and exterior LED lighting
- MGD-15 and MSHA standards incorporated throughout design

Maintainability
- Organized house/deck layouts
- Open roof architecture for safe and efficient component change-outs
- Modular systems pre-assembled in a controlled factory environment
- Internal access into major structures
- Retractable service station for easy, safe and convenient fluid refills

Flexibility
- Hydraulically articulated clamshell bucket for increased selectivity and breakout forces
- Accommodates bench heights from 6-16 m (20-50 ft.)
- Twin diesel engines for increased mobility
- Eliminates trail cable management activities
- Truck ranges 135-360 mt (150-400 st)

Reliability
- SR Hybrid Drive technology designed and manufactured in-house
- Smart Solutions enabled
- Proven fixed boom and twin handle systems for superior digging and reach capabilities
- Up to 50% fewer hydraulic components onboard than traditional hydraulic excavators
- Electric motors control main motions - hoist, swing and crowd
2650CX Hybrid Shovel

General Specifications

**MTU Detroit diesel engines**
- **Model**: 2 x 12V4000 series 4-cycle turbocharged
- **Rated power**: 2,368 kW (3200 HP) @ 1800 rpm
- **Number of cylinders**: 12
- **Bore**: 170 mm (6.69 in.)
- **Stroke**: 210 mm (8.27 in.)
- **Displacement**: 52.2 liter (1869 in³)

**Cummins diesel engines**
- **Model**: 2 x G3550
- **Rated power**: 2,368 kW (3200 HP) @ 1800 rpm
- **Number of cylinders**: 16
- **Bore**: 159 mm (6.26 in.)
- **Stroke**: 159 mm (6.26 in.)
- **Displacement**: 50.3 liter (1869 in³)

**SR generators**
- Single phase, forced air cooled
- Mounted on the right hand side of the machine
- Rated power SAE J1995

**Hydraulic system**
- **Main pumps for clamshell and propel**: 6 variable-displacement, axial piston pumps
- **Maximum oil flow**: 6 x 468 L/min
- **Maximum pressure clamshell**: 320 bar / 4640 PSI
- **Maximum pressure propel**: 285 bar / 4134 PSI

**Electrical system**
- **System voltage**: 24 V
- **Batteries in series, parallel**: 6 x 12V, 6 x 210Ah
- **Working spot lights**: 22 x high brightness LED lights
- **Service lights**: 16 x LED lights
- **APU unit (optional)**: 24VDC system (260A)

**Propel system**
- **Hydraulic motors**: 2 - axial piston variable motors (per side)
- **Travel speeds**: 1st stage - max 0.92 km/hr - 0.57 mph (low)
  2nd stage - max 1.99 km/hr - 1.24 mph (high)
- **Maximum tractive force**: 2720 kN / 611,487 lbf
- **Crawler shoes per side**: 37
- **Lower rollers per side**: 7
- **Upper rollers per side**: 3
- **Ground bearing pressure**
  - Standard crawler shoe - 1626mm/64" 29.6 N/cm² 43 PSI
  - Crawler shoe - 1829mm/72" 26.6 N/cm² 38 PSI
  - Crawler shoe - 1981mm/78" 24.1 N/cm² 35 PSI
- **Spring set hydraulic release wet multi plate disc brakes**: (1) set per motor
- **Bottom rollers (7X each side)**: oversized, fully hardened and automatically lubricated
- **Upper rollers (3X each side)**: sealed and maintenance free
- **Patent pending P&H Delta drive low tension sprocket drive system with heavy duty cast crawler shoes**

**Swing system**
- **Swing motors**: 4 x P&H SR motors @ 200 HP each
- **Swing drives**: 4 x stage planetary transmissions
- **Brakes**: Spring loaded / hydraulically released
- **Max swing speed**: 3.12 rpm
- **Slew ring gear**: Sealed triple roller swing ring, internal teeth
- **Switch reluctance (SR) electric motors each coupled with a compact planetary gearbox. Gearbox is oil filled and splash lubricated**

**Crowd system**
- **Crowd motors**: 2 x P&H SR motors @ 400 HP each
- **Twin low inertia Switch Reluctance (SR) electric motors minimize shock loading**
- **Direct drive crowd eliminates belt maintenance and improves responsiveness**
- **Modular crowd motors with integral pinion provide for simplified motor replacement**
- **Two input pinions shared load for extended life**
- **Dual spring set hydraulic release brakes for reliable redundant operation**

**Hoist system**
- **Hoist motors**: 2 x P&H SR motors @ 1,250 HP each
- **Patent pending dual planetary system located at the interior of the hoist drum eliminates externally mounted transmissions and optimizes use of deck space**
- **Patent pending drum lock design is fully integrated into the motor allowing quick and easy engagement**
- **All gearing and bearings are both pressure fed and splash lubricated with filtered oil, providing reliable operation and eliminating the need for a heat exchanger**
- **LARGE GB" diameter drum for extended rope bending life. Ferrule becket system and dual hydraulic duggers are standard for efficient rope change**
- **Spring set hydraulic release wet multi plate disc brakes** - (1) set per motor
- **Hoist rope fleeting sheave protects rope from excessive oscillation**

**Operational ranges**
- **Max reach at ground level**: 14.84 m / 48.62 ft.
- **Max dig reach**: 17.94 m / 58.53 ft.
- **Operate eye level**: 8.9 m / 29.1 ft.
- **Max dump height**: 11.54 m / 37.88 ft.
- **Height of cut**: 18.11 m / 59.42 ft.
**Overall dimensions**

- **A** Boom point height: 19.0 m (62.20 ft.)
- **B** Counterweight to boom point length: 21.0 m (68.90 ft.)
- **C** Crawler length: 9.89 m (32.45 ft.)
- **D** Center of idler to center of tumbler: 7.48 m (24.54 ft.)
- **E** Height - ground to bottom of counterweight: 2.38 m (7.81 ft.)
- **F** Height of crawlers: 2.65 m (8.69 ft.)
- **G** Deck Height: 2.24 m (7.35 ft.)
- **H** Width of crawlers: 7.6 m (25.00 ft.)
- **I** Overall machine width: 14.13 m (46.36 ft.)
- **J** Crawler shoe width (standard size): 1.5 m (5.30 ft.)
- **K** Height - ground to cab body: 1.13 m (3.69 ft.)

**Machinery house layout**

- **A** Diesel engine
- **B** Auxiliary seat
- **C** Engine radiator
- **D** Gearboxes with hydraulic pumps
- **E** Gearboxes with hydraulic pumps
- **F** Gearboxes with hydraulic pumps
- **G** Engine radiator
- **H** Operation’s seat
- **I** Front swing motors and transmissions
- **J** Hydraulic tank
- **K** Valve bank (pilot and main valves)
- **L** Auxiliary radiator (not shown - below valve bank platform)
- **M** Converter cooler
- **N** Engine coolant (RH)
- **O** Open gear lube
- **P** Hydraulic oil
- **Q** LH deck service station
- **R** Converter cooler
- **S** Engine coolant (LH)
- **T** Open gear lube

**Control system - LINCS II**

- **LINCS II**
  - Microprocessor based modular design Vehicle Control Unit with monitoring and diagnostics including integrated data logging and storage
  - LINCS II uses a dash mounted full color touchscreen display as the operator interface; out of range conditions will cause an audible alarm along with a message screen that is color coded to indicate severity
  - In addition, the touchscreen display provides repair technicians with operational data and fault messages

**Operator’s cab**

- **Internal cab dimensions**
  - Length: 2460 mm (96.5”)
  - Width: 1845 mm (72.5”)
  - Height: 2320 mm (91.7”)
- **Fall-Object Protective Structure (FOPS)**
  - ISO 3449
- **Carbody noise**
  - (high idle with AC on high) 74 dBA
- **Air conditioner**
  - 2nd optional unit: 5.25 kW - 18k Btu/hr
  - 10.5 kW - 36k Btu/hr
- **Heater**
  - 14.8 kW - 50K Btu/hr

**Fluid capacities**

- **Fuel tank**
  - Volume (L): 8574
  - Volume (gal): 2265
- **Engine oil**
  - 2 x 190
  - 2 x 50
- **RH/LH engine high temp coolant**
  - 1317
  - 348
- **RH/LH engine low temp coolant**
  - 639
  - 169
- **MPG tank**
  - 235
  - 62
- **OGL tank**
  - 575
  - 152
- **Hydraulic oil tank**
  - 2082
  - 550
- **RH pump drive transmission**
  - 63
  - 16
- **LH pump drive transmission**
  - 58
  - 15
- **Propel gearcase**
  - 2 x 227
  - 2 x 60
- **Swing gearcase**
  - 4 x 16
  - 4 x 20
- **Crowd gearcase**
  - 530
  - 140
- **Hoist gearcase**
  - 575
  - 156

**Clamshell bucket**

- **Nominal Payload**
  - 59 mt (65 st)
- **Standard HD bucket @ 1.9t/m³ (2:1 heaped)**
  - 31.1 m³ (40.7 yd³)
  - Lip width: 2000 mm
  - Weight without wear package: 67,719 kg (149,934 lbs)
  - Weight with wear package: 70,105 kg (154,554 lbs)
- **Overburden bucket**
  - 36 m³ (47.1 yd³)
  - Iron ore bucket: 271 m³ (34.9 yd³)

**Service station**

- **Ground level service station**
  - Fuel
  - Engine oil
  - Engine coolant (RH)
  - Multi purpose grease
  - Open gear lube
  - Hydraulic oil
  - LH deck service station
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Smart Solutions

Komatsu recognizes the diversity of our customers, allowing them to select from flexible service offerings that are designed to help maximize performance and productivity of P&H and Joy mining equipment. Customers are served directly by Komatsu Mining service centers and distribution facilities that are regionally located and globally linked. The following service offerings are designed to help achieve each customer’s unique objectives:

Service products and consumables
Our service products and consumables (SP&C) are engineered and specifically selected to meet application and design standards. With dedicated regional warehousing and computerized inventory systems, we can assure timely and cost effective SP&C delivery to our customers anywhere in the world.

Machine assembly and rebuild
Our service teams are structured to be the preferred resource for every machine rebuild by applying new machine assembly factory best practices culminating with our Flawless Start Up process. Our assembly and rebuild program is backed by a complete range of OE services including SP&C, Component Exchange Program (CEP), on-site project management, labor, shop services, as well as a wide range of technical support.

Component exchange program
Production goals will only be achieved if machines remain in operation. Minimizing machine downtime during planned and unplanned outages is critical to maintaining production goals. Our Component Exchange Program provides a ready supply of like-new, remanufactured components incorporating the latest design improvements, available from regional warehouses for same day or next day delivery.

Technical and field services
We offer factory-trained service technicians and skilled tradesmen to maintain and repair customers’ equipment 24/7, 365 days/year. These regional service teams are regularly trained and recertified to maintain high proficiency standards.

Service center repair
Our unique direct service business model enables customers to deal directly with Komatsu Mining service centers offering expedient turnaround time and high-quality service repairs based on OEM specifications. Each service center is staffed with experienced and well-trained technicians committed to delivering quality and reliability.

Life cycle management
Through collaboration, operational excellence and integrated technology solutions, we partner with our customers to provide the asset management strategy needed to achieve desired results. Customers can select from LCM options that complement their support structure to reduce costly downtime, optimize equipment performance and take the uncertainty out of maintenance, repair and rebuild management.

Prognostics and remote health management
Leverage predictive, prescriptive and real-time operational analytics to transform that data and information into actionable knowledge for production and maintenance teams. Integrated services and technologies enable customers to achieve increased production, higher availability, better utilization and improved profitability.

The 2650CX combines two loading tool concepts, using the best of each for increased flexibility and lower total cost of ownership.

Contact a Komatsu Mining service representative for more information on the P&H 2650CX or visit www.mining.komatsu