



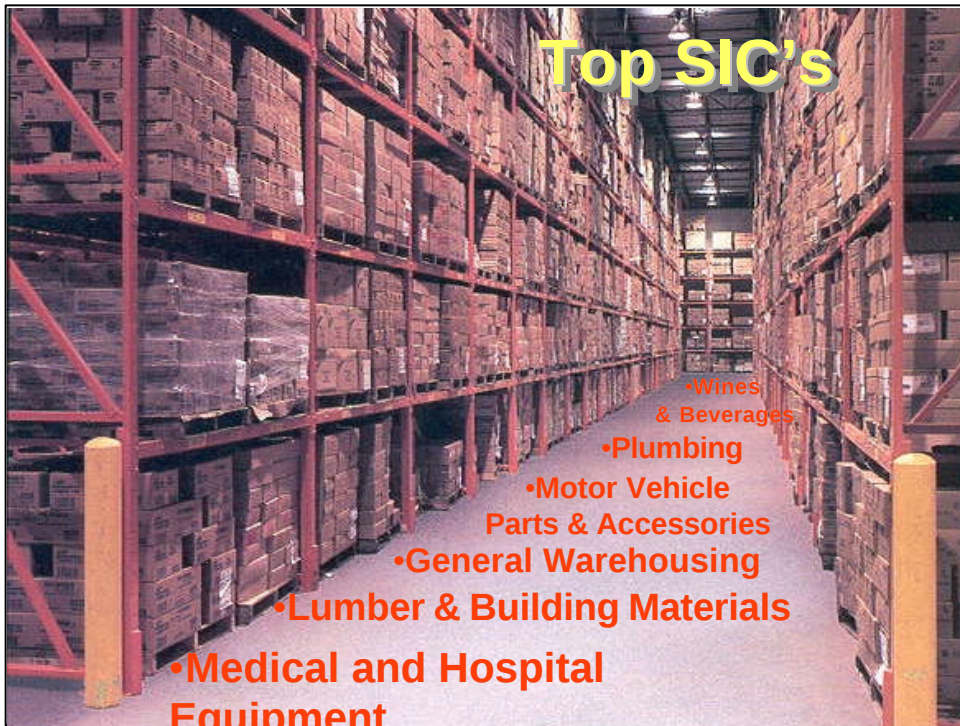
Introducing the new R30XMS2 orderpicker from Hyster Co. In 1996 the North American market size for order pickers was 5759 trucks. In 1999, the market size had grown to 8439 trucks. So, the market size for order pickers has grown by more than 40%. Hyster Co.'s share of that market is less than 10%. As you can see, there is a lot of untapped potential in this market. The improvements that we have made to this truck make it more durable with less maintenance downtime while improving operator ergonomics to provide you with a more competitive truck.



Product Position

- Light to Moderate Duty Cycle
- Basic Orderpicker
- MFH to 240"
- Single Speed Lift/Lower
- Affordable, Cost-effective Orderpicking Solution

Hyster Co. offers a complete line of orderpicking trucks. The R30XMS2 provides the customer with a cost-effective, basic orderpicker that features Maximum Fork Heights (MFH) to 240" with single speed lift and lower functions. It's ideal for the smaller warehouse operation.

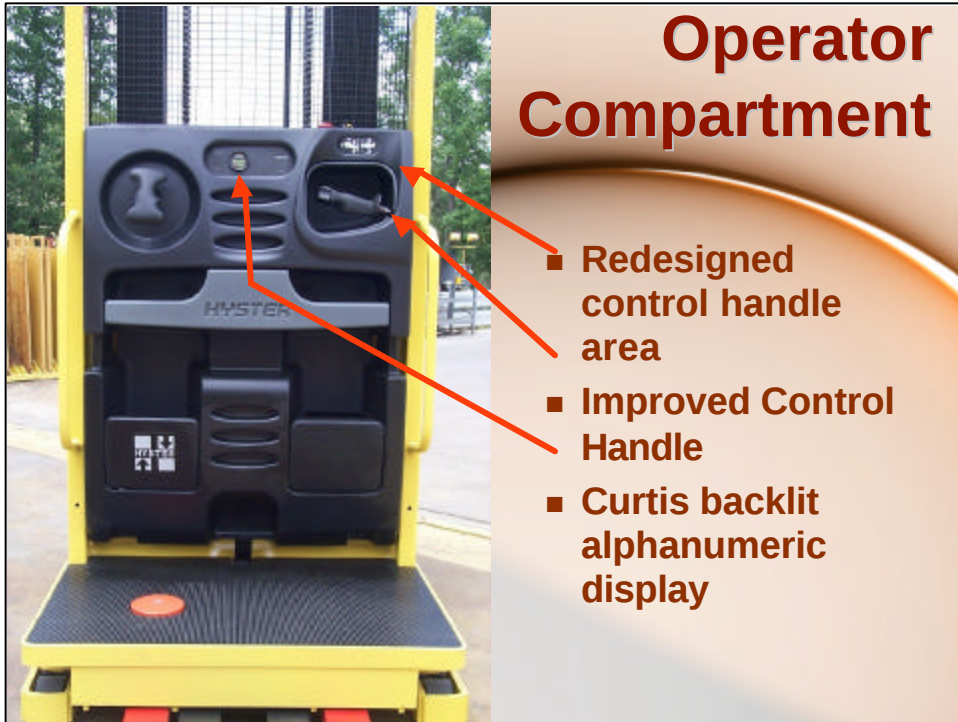


Some of the top SIC's for this model are indicated in this slide.

Highlights

- Operator Compartment Ergonomics and Controls
- Truck Control Systems
- Competitive Information

This presentation will cover operator compartment ergonomics and operator controls, truck control systems, and some competitive information.



The upper console cover has been re-contoured to provide additional operator comfort when traveling forks first.

The new Curtis backlit alphanumeric display is compatible with the new Controller Area Network (CANbus) communications system. It allows the display of fault messages as well as battery discharge indicator and hour meter. It's also used during set up procedures to see menu and performance parameter values.



The new multifunction control handle provides improved operator comfort. A thumb-actuated rotating switch controls single speed lift and lower functions. It is spring loaded to return to the neutral position when released. A trigger switch operates the horn. Forward and reverse motion are achieved by moving the handle in the direction of desired movement. The handle can be turned and locked in three possible orientations depending on operator preference to provide the operator with the most comfortable position possible. The handle is designed to accommodate travel in the forks first position or chassis first. To maximize operator comfort for operating the truck in the forks first position, the truck should be equipped with the optional vertically adjustable operator console. The control handle is also spring loaded to return to neutral when released. The handle is also used in conjunction with the alphanumeric display during setup to set truck performance parameters.

Control Handle Ergonomics

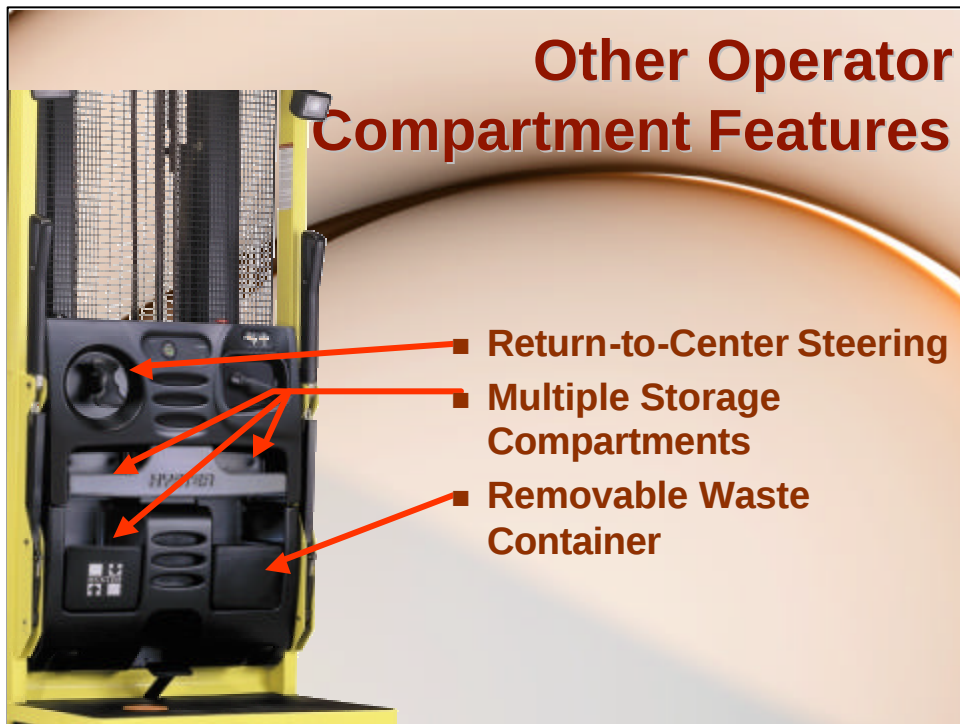


Two new features provide the operator the flexibility of comfortably operating the truck forks first or drive unit first. They are a new, re-contoured control handle area that has been scalloped out to provide more operator arm room for driving forks first, and a new redesigned control handle that will turn and lock in three separate orientations depending on operator preference.



When the system detects a truck fault, an audible alarm occurs, and a red light appears on the wrench icon. Beneath the wrench icon, a fault code or message appears in the alphanumeric LCD display. This provides real-time onboard diagnostics. The truck goes into a safe mode at that time. The safe mode selected by the truck will be determined by the nature of the fault. For example, if the truck detects a problem in the traction control system, it will stop the truck by applying the electric brake. If the truck detects a problem with the height encoder, slow travel speed will be permitted to allow the truck to be driven to a maintenance area. In general, the safe modes allow as much performance during abnormal or fault conditions as is possible.

The slack chain indicator has been incorporated into the backlit alphanumeric display. In addition to control system diagnostics, the display is used in conjunction with the control handle for setup of the truck's operating parameters.



Other operator compartment features include ; Return to Center Steering(standard; Multi turn steering is optional), multiple storage compartments, and a removable waste container.

Return to center steering - what and why? The drive tire automatically returns to the center straight ahead position when the handle is released. This reduces wear to the drive tire. For rail-guided trucks, this reduces guide roller wear and rail maintenance. Possibly even more important, Return to center steering reduces operator fatigue and facilitates ease of operation in the forks-first position.

Other Operator Compartment Features



- Emergency Disconnect Button
- Beverage Holder

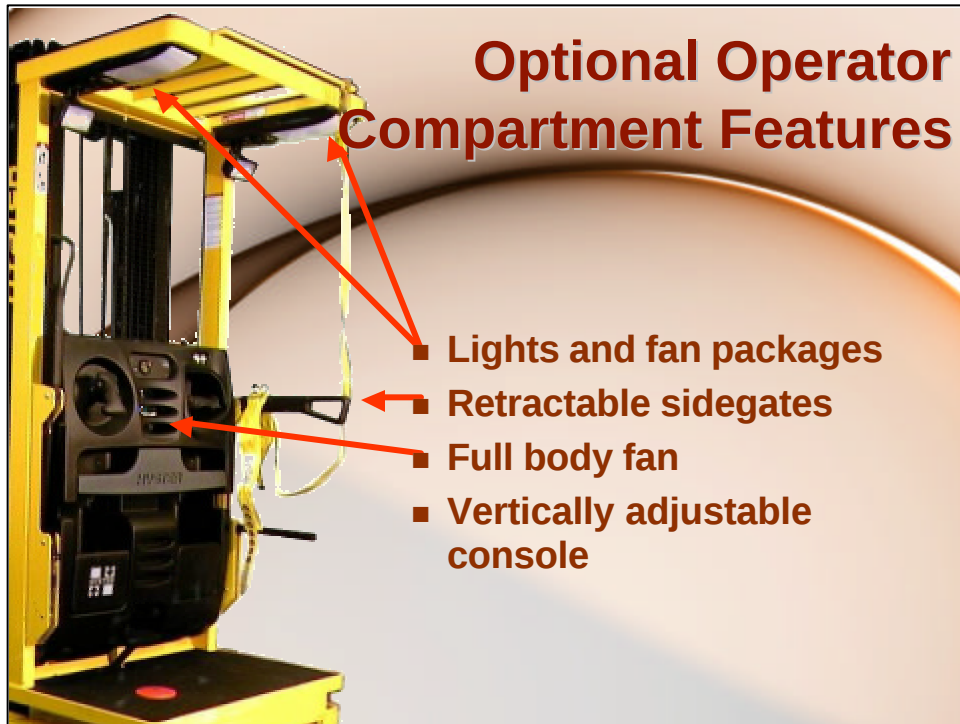
The emergency disconnect button is conveniently located on top of the operator console for quick, easy access. There is also a beverage container provided.



The foot switch / brake release is conveniently located in a position that allows the operator to stand naturally in the center of the operator's compartment in a comfortable stance.

The pallet clamp automatically centers and grips the pallet to allow fast, easy order picking. A foot operated pedal is easily actuated for quick pallet release. Crown's pallet clamp is foot applied / hand released.

The platform also features a full one inch thick rubber floormat for maximum operator comfort.



The optional overhead fans and lights package provides illumination for the operator compartment, the fork area, and the bins. The fan has adjustable louvers to provide ventilation to the operator.

The optional flip-up side gates are gas spring assisted for easy one hand operation. They offer side protection while the ease of operations provides quick access to and from the operator's compartment. Side gate interlock switches are provided to disable lift/lower and traction control while sidegates are raised.

The optional two speed full body fan provides maximum ventilation directed to the operator's mid-section. This is convenient for operators who prefer not to have the airflow directed to the head.

The optional adjustable console height provides a 6" vertical range of adjustability to accommodate most operators regardless of stature. It's important to remember that this feature is strongly recommended when specifying a truck in which the operator runs the truck primarily in the forks-first position.

Corner posts are available as an option from Applications Engineering. These posts are constructed of square steel tubing that run from the overhead guard to the operator platform. They are designed to offer additional protection and are required in applications that involve using the truck in right angle stacking within racking.

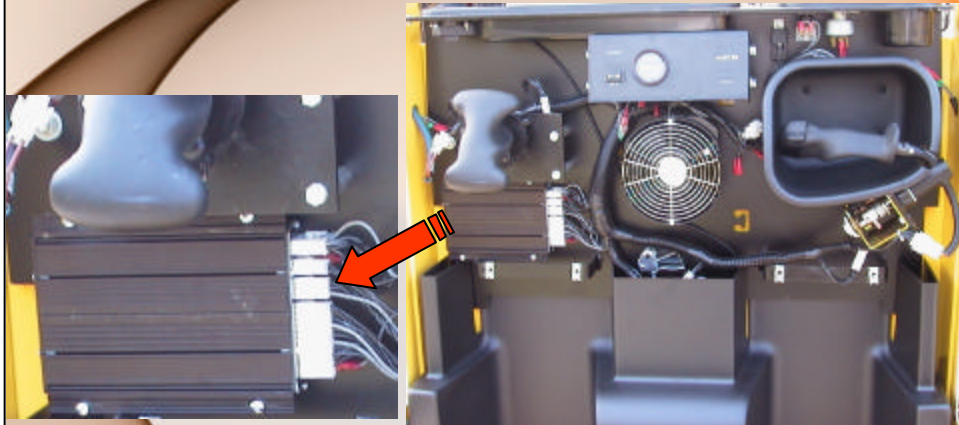
Control Systems

- **Controller Area Network (CANbus) Communications System**
- **Separately Excited Traction Motor**
- **MOSFET Traction Controller**
- **Inmotion Steering System**
- **HySense ä Continuous Height Sensing**
- **Braking Improvements**

The truck features a number of new control systems. We will look at how the CANbus system manages truck system communications. In addition there is a new SEM motor, which is controlled by MOSFET traction controller. The new steer system is provided by Inmotion, formerly Atlas Copco. A new feature called HySense™ continuously senses the fork height and adjusts maximum travel speed. There are also improvements to the braking system that we will discuss.

Controller Area Network (CANbus)

■ Curtis 1310 Controller



Controller Area Network or CANbus allows the truck's multiple control systems to be connected using a pair of wires known as a CANbus. This type of system is ideally suited to orderpickers where the operator's compartment is raised and located remotely from the control devices in the chassis. CANbus technology permits a significant reduction in the number of electrical conductors which must be reeved over the mast between the chassis and the operator's platform. The number of conductors has been reduced from 21 to 8. This reduction provides an extremely durable and reliable design. The CANbus system is controlled by the Master Control Unit: a Curtis 1310 unit located on the operator's platform. The Master Control Unit (MCU) sends signals from the operator's input (i.e., lift/lower, forward/reverse, etc.) to the controls in the chassis below. Extensive testing has been performed on the MCU to ensure its reliability.

The CANbus technology allows single point diagnostics through the new dash display.

CANbus Communications

- Operator input sends signals to truck systems
- Continual monitoring of truck systems



Electronic boxes connected by the CANbus link are the Curtis 1310 Master Control Unit(MCU), the Curtis 1243 Traction controller, The Inmotion Advanced Power Steering(APS), and Wire Guidance unit(optional). The Canbus link carries the following data: Traction throttle, Traction direction, horn, lift/lower, steering position, steering rate, wire guidance(optional), status information, parameter change downloads, and diagnostic information.

The MCU (Curtis 1310) receives input from the following devices.

- Throttle -Controlled by a Hall-effect sensor.(a non-contact solid state sensor which eliminates the throttle potentiometer for a more reliable design.)
- Lift and lower switches
- Horn switch
- Foot switch (Brake release)
- Slack Chain switch
- Steering position encoder (a sensor bearing encoder which is integral to the upper part of the steer motor. It provides a drive unit position signal which eliminates the steer feedback potentiometer.(MDU pot)(Very reliable design)
- Height encoder - an optical encoder detects mast chain pulley rotation which is directly proportional to operator platform motion. There is a mast proximity switch at 24" that calibrates the position. The encoder reads each turn of the pulley to continually sense fork height.
- Return-to-center steering proximity switch

CANbus Advantages

- Increased reliability
- Substantial reduction in connections and wiring complexity
- Extensive function monitoring
- Fast data rate allows real time control
- Access to all controller parameters through a single CANbus port

Separately Excited Traction Motor



The 6.6" traction motor replaces a 7.3" traction motor. The reduction in size is achieved with better performance due to the SEM system and regenerative braking. Regen braking is when the kinetic energy of the moving truck is converted to electrical energy by the motor and routed to the battery where it converts to heat and dissipates during plugging. In the previous system, the traction motor converted the kinetic energy into heat which had to be dissipated by the motor itself, thus requiring a larger motor. This also results in improved motor brush life, which improves reliability and reduces maintenance costs.

Hall effect accelerator input provides improved speed control and acceleration. This new design increases reliability by eliminating the accelerator potentiometer.

Hall effect devices are used in applications to replace potentiometers. A potentiometer relies on an electrical connection of a moving wiper in contact with an element. This contact surface is prone to wear and contamination from vibration and moisture.

Hall effect devices use sensors which measure magnetic fields. They use a magnet mounted on a mechanism which moves the magnet closer or farther from the sensor. Since there is no contact between the magnet and the sensor, there are no electrical moving parts to wear out. Only the shaft and bushing are subject to wear, and will typically last many millions of cycles. The shaft is sealed to prevent moisture contamination.

In a further simplified explanation, the difference between a potentiometer and a Hall effect device is like the difference between a CD player and a record player. The record player has a needle that makes direct contact with the record, causing wear on the needle and the record as well. The CD player has a non-contact device that reads the data from the CD without making contact.

SEM Traction System

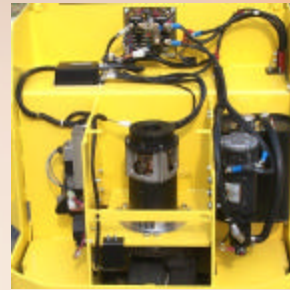
- Permits Reduced Chassis Wiring
- Eliminates Forward/Reverse Contactors



Crown System



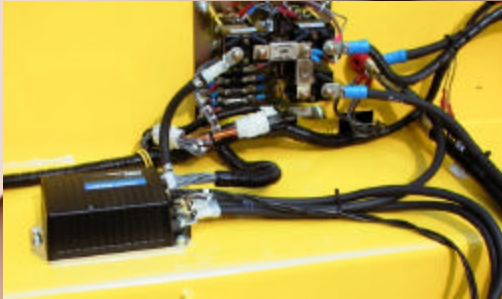
Caterpillar System



Hyster System

The new SEM traction system, in conjunction with the CANbus system, provides a simpler, cleaner design with no forward/reverse contactors and less wiring. Compare the service compartment to that of a Caterpillar or Crown order picker.

MOSFET Traction Controller



- Eliminates forward and reverse contactors
- Improves reliability



The **M**etal **O**xide **S**emiconductor **F**ield **E**ffect **T**ransistor (MOSFET) traction controller is a Curtis 1243 unit. It can control and change direction of the current to the traction motor in response to directional changes from the operator. This eliminates the forward and reverse contactors. The Curtis 1243 also controls lift and lower functions.

The 1243 controller reduces plugging aggressiveness at elevated heights to provide smooth traction control.

Steering System



- Three-phase brushless steer motor requires no maintenance

Electronic Horn

Steering is provided by an Inmotion (formerly Atlas Copco) gear motor and controller. The system uses a three-phase brushless DC motor with integral gear box assembly and a controller with Canbus communications. No brushes....no maintenance.

The horn is replaced with a more reliable electronic horn. It also provides a quick test to see if the CANbus system is working. If the horn works, the CANbus system is receiving communications from input devices.

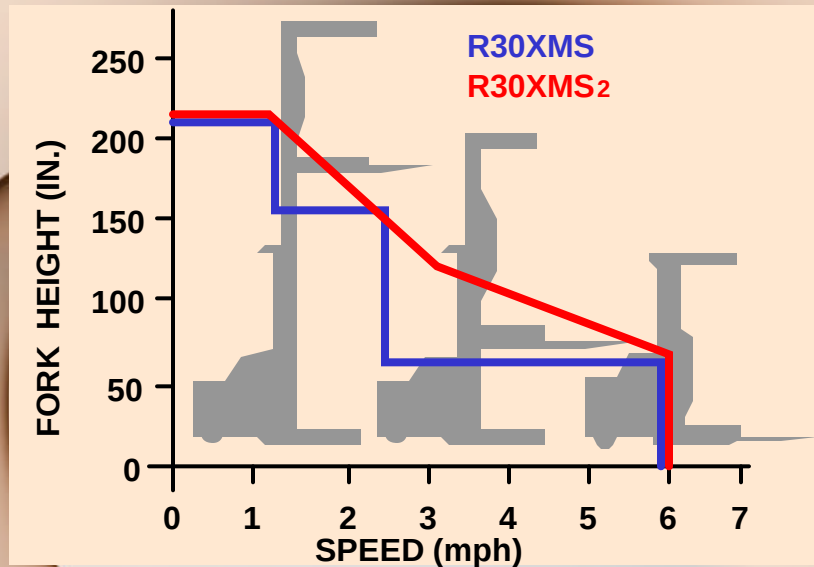
Steering System



■ Sensor Bearing Encoder

The steer system is equipped with a sensor bearing encoder and a steering proximity switch that automatically centers the steer wheel at power up. Integral Hall effect sensors eliminate dip switches, potentiometers and tachometer to reduce steering adjustments and maintenance. The only adjustment needed is calibrating the steering proximity switch at the drive unit straight ahead position. The control system receives steering command signals from a second encoder mounted behind the steering wheel/handle through the CANbus system. The steering controller monitors performance and sends signals to the truck controller(Curtis 1310) if faults occur.

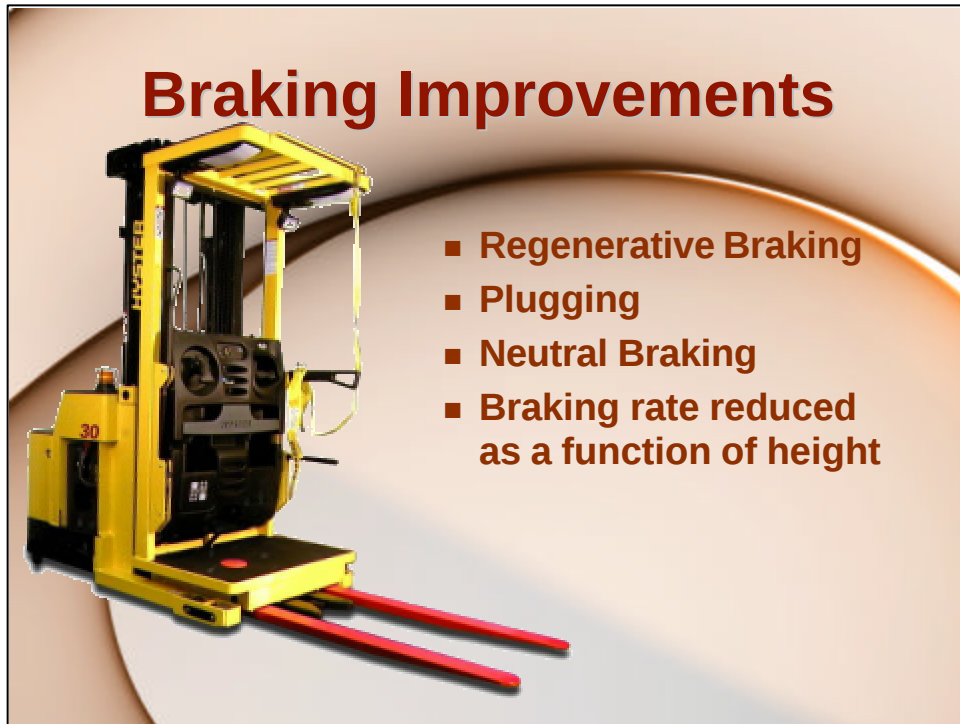
HySense ä Continuous Height Sensing



In the previous system, travel speeds are stepped down at set intervals of fork height. In the new system, unloaded travel speeds are reduced approximately 1 MPH for every 22.5" in increased fork height between the heights of 60" and 150". Therefore the reduction in speed is smooth, gradual and is less noticeable to the operator. Travel above 150" fork height is optional. (Capacity reduction required. Contact SPED for capacity ratings.

The drive unit is also monitored by the MCU to further reduce travel speeds when steer angle is greater than 10° with fork height greater than 24".

Mast height is monitored by a solid-state optical encoder. The encoder is a sealed unit which requires no maintenance or cleaning.



Regen braking (actuated by plugging) slows to a stop then applies park brake. Plugging is variable in relation to the actuation of the handle. Neutral braking (the automatic light braking of the truck) is adjustable and occurs when the multi-function control handle is released and returns to the neutral position. Braking aggressiveness is reduced as a function of height to provide smooth operation.

Five methods of stopping provided:

- Plugging - This is the recommended method of reducing truck speed and changing travel direction. To plug, move the control handle through the neutral position to the opposite direction of travel. The controller provides proportional regenerative braking. The rate of deceleration is proportional to the position of the handle.
- Footswitch- Aggressive regen braking is provided when the operator releases the footswitch. As the truck comes to a complete stop, the parking brake will apply.
- Non-traction fault - If a stop is triggered by conditions other than a traction control system fault the system will plug (regen) to a stop and apply the electric brake. (i.e., wire guidance loses the wire; steering system sends a shut down command to controller)
- Traction system fault - will disable travel and fully apply park brake
- Emergency button or key off- will apply the park brake immediately

Braking Improvements



Advantages

- Abrupt stops diminished
- Tire lock up reduced
- Reduced park brake wear

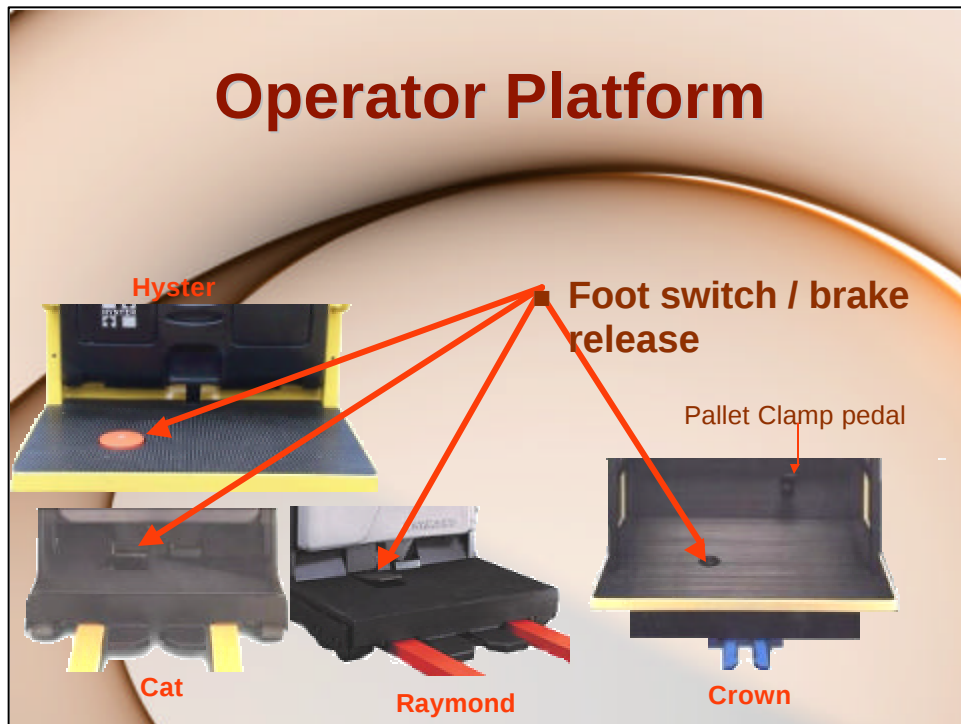
The braking logic limits the application of the parking brake while traveling. Abrupt stops are diminished. This reduces tire lock up and decreases drive tire wear. Since the truck plugs to a stop, it also reduces wear on the park brake.

Competition

Ergonomics



Only Hyster comes standard with return to center steering. RTC reduces operator fatigue, facilitates ease of operation in the fork-first position, and is readily adaptable to rail and wire guided applications.



The foot switch/ brake release on Hyster orderpickers is flush mounted to the operator platform. It's also located in a natural position for the operator to enjoy a more comfortable stance. Cat and Raymond brake release pedals stick up requiring the operator to step up and over them. Also, note the high position of the pallet clamp pedal on the Crown truck. The Crown pallet clamp is foot applied, hand released.



Multi-function control handles. Cat and Raymond have them. Crown does not. What sets one apart from the other? First off, Crown features a motorcycle style twist grip with buttons for lift, lower and horn that are not located on the handle itself. Hyster, Cat and Raymond all have a thumb actuated lift / lower control. Four things about the Hyster handle set it apart. Note the Hyster handle has been set in a position to allow the hand to rest on it naturally and comfortably. The Hyster handle is also equipped with a palm rest to give it additional support, especially when traveling drive unit first. The Hyster handle can be turned and locked in three separate positions, depending on operator preference to provide an even further degree of operator comfort. Finally, the Hyster handle is positioned in such a way that, in conjunction with the re-contoured console area and the optional adjustable console, it is beneficial when operating the truck in a forks-first position.



The Hyster service compartment is clean and uncluttered. Bi-parting steel doors open quickly and easily with no tools required. The lightweight, ABS plastic top service compartment cover is held in place by two spring load bolts that grant access in seconds. Cat, Crown, and Raymond service compartments are crowded and cluttered.

The Cat, Crown, and Raymond Trucks have both a battery cover and a battery retainer which must be removed to change the battery.

Crown service compartments are displayed on the next slide.



Hyster

Serviceability



Crown
30SP36



Crown
SP3000



Hyster orderpickers feature load wheels that have closed toe caps for additional load wheel protection. Cat, Crown and Raymond all have open toe caps leaving the load wheels unprotected.

Competitive Specifications

Make	WYSTER	Crown	Crown	Raymond	CATERPILLAR
Model	R30XMS2	30SP36TT	SP3010-30	OPC30TT	NOR30
Head Length	72.03	74.6	74.6	72.5	72
Overall Width	41.25	42	42	40	40
Height to Top of OHG	80.4	79	90	85.0	80.5
Standard Mast: MFH/CAH	213/95	210/95	235/95	204/95	137/95
High Visibility Mast	STD	STD	STD	STD	STD
Wheelbase	55.1	51	52	60	60
Travel Loaded STD Voltage	5.5	5.3	5.3	6	5
Travel Empty STD Voltage	6	6	6	6	5.3
Lift Speed NL/RL	42/26	40/26	45/28	45/33	45/35
Lower Speed NL/RL	42/42	40/38	40/38	40/40	40/40
Battery Voltage STD	24	24	24	24	24
Battery Compt-Size WxLxH	13.5 x 36 x 24.7	14x36.88x30.88	14.25x36.25x31	14x36.88x30.88	14x36.88x30.88
Step Height	8.44	8	8	8	8.0
Operator Platform Width	40	42	42	39	39
Drive Control	Curtis SEPEX Transistor	Transistor	Transistor	Transistor	Transistor
Drive Tire	12 x 5.5	13 x 5.5	13 x 5.5	12 x 5	12x5
Load Wheel	4 x 3	6 x 2.8	6 x 2.8	6 x 3.63	6x3.6
Extended Height	299.4	298	298	289	325
Power Steer	ON DEMAND	ON DEMAND	ON DEMAND	Power	Power
Turning Radius (inches)	65.9	68	69	72	72
Free Lift	0	8	6	10"	n/a
Fork Spread	21"-28"	24"-30"	24"-30"	24"-28"	24"-28"

