

**Delivering Customer Value in Material Handling  
Via Technology and Innovation**



The widespread use of technology in consumer goods is beginning to change the expectations of the lift truck customer.

Microprocessors and other enabling devices are advancing at speeds barely imaginable just 10 years ago. Tens of millions of lines of code now command hundreds of millions of instructions per second on processing devices developed for cars, computers and handheld devices. For warehouse managers striving to get the most from their fleets and operators, applications of this technology may be implemented to benefit their lift truck operations in numerous ways.

At Crown Equipment Corporation, a global leader in material handling, multi-disciplinary project teams include personnel from engineering, design, manufacturing, sales and marketing to synergistically find innovative ways to apply technology to meet the dynamic and demanding needs of lift truck owners and operators.

Crown is maximizing the latest enabling technology, creatively employing and enhancing best practices from non-related industries and employing a systems approach to manufacturing lift trucks. That strategy helps companies manage their fleets with unprecedented customization.

The result for the material handling industry is higher performance and productivity, improved safety, greater operator comfort, convenience and lowest total cost of ownership.

## Engaging Operators

Crown project teams like to get out on the warehouse floor and observe how lift trucks are being used in the real world. Based on practical experience and observations, Crown project teams utilize innovative thinking to enhance operator performance. They see the body language and the looks on many faces of lift truck operators after completing an 8 or 10-hour shift. They see the job's physical demands and how it may negatively affect productivity, safety and performance.

Applying the latest advances in sensing technology, automotive suspension design and dynamic simulation testing, Crown developed FlexRide™ Suspension. Now, shock and vibration that was absorbed by the operator is isolated. This unique design adjusts to the operator and reduces shock up to three times more than other stand-up trucks and allows operators to fine tune the ride to their preferences.

After gaining a thorough understanding of the characteristics of optimal comfort, the members of a project team developed advanced seating technology and suspension systems used in the luxury automotive industry. The enhancement of backrests, hip pads and adjustable armrests, along with innovative footrests, also contributes to overall operator comfort. A Crown project team gets even more enthusiastic about their work when a lift truck operator finishes a 10-hour shift by saying "that feels unbelievable."

## Technology and Vertical Integration

Another example of applying technology to advance the material handling field is the solution for the planetary gearboxes now used on the Crown RC 5500 Series.

Planetary gearing is a gear system that consists of one or more outer gears, or planet gears, rotating about a central, or sun gear. Typically, the planet gears are mounted on a movable arm or carrier which itself may rotate relative to the sun gear.

The concept is decades old, but the application to the lift truck industry is fairly new. One benefit of a planetary design is its compact design. However, a drawback to conventional planetary designs has been generally higher noise levels when compared to more traditional gearbox designs. By incorporating gearbox designs to reduce noise, Crown was able to overcome this drawback for its planetary gear system to provide a gearbox that is both compact and low noise.

With space at a premium on lift trucks, the benefit of the new compact gearbox lies in providing more space for the operator and better access to serviceable components. Simplifying the serviceability of the lift truck has set Crown apart in the industry. Moreover, operators appreciate the expanded operation compartment and the reduced noise of the lift truck.

This example accentuates the multiple benefits of Crown's commitment to vertical integration – Crown manufactures approximately 85 percent of its own components:

- First, Crown identifies emerging technologies and then applies them.
- Technology then allows performance and features to be customized, meeting the exact expectations of the customer.
- Feedback is available immediately, thanks to worldwide distributors and sales branches.
- Finally, the development team gets information they need immediately and directly.

In short, Crown makes use of emerging technologies for material handling and then applies them for the long-term benefit of its customers.

## Systems Approach to Technology

The unique confluence of multi-disciplinary project teams and enabling technologies is just part of a comprehensive systems approach that makes Crown a true lift truck designer and manufacturer, not just an assembler of lift truck components.

Crown looks at the lift truck as a whole, not as a mere collection of separate systems. When other companies purchase parts from third-party suppliers, they have to accept the limitations and scarcity of choice when it comes to performance. Not so for Crown and its in-house design and manufacturing capabilities.

The backbone of the systems approach for Crown lift trucks is Access 123® Comprehensive System Control, which monitors and controls all systems to ensure superior safety, serviceability, performance and reliability:

- Information shared among traction, braking, steering, hydraulics and other truck systems is used to optimize performance and reliability.
- Each system makes adjustments that improve safe performance and reliability, based on real-time information.
- The Access 123 display communicates vital information to operators and technicians, including advanced diagnostics and troubleshooting.

Crown's method of communication and control substantially expands performance potential because the truck knows what's going on. Switches, sensors, potentiometers, controllers and other communicating components continually monitor truck lift systems. The wealth of real-time information may include the speed and direction of the truck, position of the forks, thermal ranges, operator performance levels and functions selected, among many others.

One way safety is enhanced is with the benefit of curve control – the ability of a Crown lift truck to sense the turning radius of the wheels and reduce the speed of the truck automatically – providing greater stability in turns.

Sensors recognize the moment changes occur and immediately act on them, even faster than human response time. The truck knows when to be extra safe even before the operator does. Balance is critical for reliable performance and it is a key element in the systems approach to building a lift truck. A mismatch of motor, controller or drive unit, for example, will impact performance in many ways. Over time, it's likely to degrade performance and lead to early component failure.

Access 123 Comprehensive System Control provides further advantages by taking into account the capabilities of the lift truck and the needs of the user and application. Programmable performance settings make it easy to tune the truck for different skill levels and application needs.

Advanced diagnostic capabilities of the system follow an intuitive approach by simplifying troubleshooting. Unique aspects designed to save time and improve performance allow technicians to:

- Pinpoint faults and test components, all through the display.
- Eliminate the need for handsets or PC-based utilities.
- Easily calibrate, diagnose and program lift truck systems through the display.
- Monitor a component's current and voltage in diagnostics mode.
- Test component functionality at full-rated power.

The bottom line benefit is the lowest cost of ownership with Crown lift trucks.

## Fleet Management

The next step in lift truck technology is to obtain and be able to quickly analyze real-time data on operations of an entire fleet. This data may be just as important for small, local fleets as it is for international companies with more extensive fleets.

Customized wireless communication systems allow microprocessors and other enabling technologies deployed on Crown lift trucks to seamlessly integrate in real-time with the existing infrastructure of the customer's enterprise. This user-friendly, scalable and highly customizable technology has enabled Crown to help its customers maximize their asset utilization and increase the value of their fleet. It's an example of warehouse management and fleet management systems merging to provide more value to the customer.

The InfoLink® wireless fleet management system distinguished Crown as the first lift truck manufacturer to develop, manufacture and market a state-of-the-art fleet management tool. The system will also be supported through Crown's established dealer network. This technology provides warehouse managers with information to manage their systems as efficiently as possible.

The InfoLink system comprises a user-friendly, on-board operator interface that wirelessly communicates lift truck data to a central server using the network and server that most warehouses already have in place. Through InfoLink, warehouse managers can compile data on how many hours each truck is in operation; control who is allowed to operate any given truck; ensure that safety inspections are conducted by each operator; manage planned maintenance programs; and be alerted of and track when and where trucks have been in a collision.

Warehouse managers need to know if their fleet is the right size and if each truck is being used in the most efficient manner possible. By comparing data across their facilities, Crown customers can receive the information that provides them with a competitive edge.

The InfoLink fleet management system is the only fleet management system that incorporates Crown's expertise in lift trucks and material handling applications. As Crown was developing InfoLink, its industry experience played a key role in addressing customer and market-specific needs. For instance, it helped them identify the most effective placement of a sensor and its sensitivity level for individual applications. Providing service support on a national basis can be difficult for pure software providers. Crown's established dealer network creates a competitive advantage and is a value-add for InfoLink customers.

Crown is concerned about what worries its customers. Product development begins and ends with talking to customers, and our discussions revealed that fleet management and asset utilization was a high priority. With InfoLink they will have ongoing statistical measurements to gauge fleet performance and utilization.

InfoLink – together with Crown's FleetSTATS® fleet service tracking, accounting and support program – offer a complete asset utilization system for those who are working to lower operating costs.

Data collection is the genesis of the FleetSTATS program. The information pulled from FleetSTATS data helps Crown customers make informed business decisions. Additionally, centralized invoicing simplifies the process, consolidating multiple invoices into one, saving time and reducing paperwork. The end result is powerful data, cost savings and enhanced management capabilities.

Crown offers several levels of reports specifically focused on giving companies more control over service and parts costs, usage and efficiency, including:

- Consolidating and highlighting data to analyze different usage patterns and identify lift trucks that require excessive service or which are under-used.
- Cutting the data in different ways to evaluate repairs by facility, lift truck or part.
- Analyzing rental versus purchase decisions or life-cycle considerations, so customers can make the most informed and cost-effective decisions.

The FleetSTATS program gives companies the information they need to help manage their lift truck fleets more effectively, and they benefit from Crown's lift truck expertise also. Crown representatives meet regularly with customers to review FleetSTATS reports. The Crown representatives conduct fleet service performance evaluations, plus receive practical information on service and application issues, recommendations for improvements and ongoing follow-up.

## Technovation™

Technology and innovation. They are integral to everything Crown does in helping meet and exceed customer needs. In fact, Crown has coined a word to define the fusion of technology and innovation: Technovation™.

By leveraging the multi-disciplinary creative talents at Crown with a passion for the product, Crown delivers value for its customers via the innovative application of enabling technology. This commitment to performance, reliability, safety and value is inherent in all Crown's products and services.

The results are clear and well documented – Crown's Technovation means the lowest cost of ownership and the highest level of productivity for both owners and operators. In short, an unparalleled lift truck experience.

The window to a positive future is wide open.