TFC™ TOUCH FORCE CONTROL

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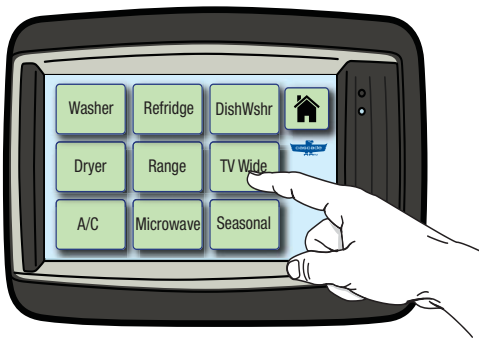
TFC™ - Touch Force Control

TFC™ - Touch Force Control–is an innovative new pressure and clamp force control system invented by Cascade Corporation for warehousing operations. The primary targeted application for TFC™ is Carton Clamp users, but it may also complement Paper Roll Clamps, Layer Pickers or any application where regulating clamp force is necessary. The only requirement is the ability of the driver to differentiate between different load configurations. The system is easy-to-use, driver-friendly, visual, interactive, highly flexible and accurate. It provides the capacity for applying a unique clamp force on up to 486 different load configurations in just one, two or three screen touches. The most significant benefit is that there is no memory work required on the part of the driver to determine what clamp force setting is needed for each unique load configuration. The driver simply needs to confirm on the screen what is visually in place to be picked up and moved.



Background:

The material handling industry moves millions of unitized boxed loads and white goods loads in a steady stream from factory, to warehouse and onto the final destination. The industry is challenged to provide damage-free handling throughout the supply chain process. One of the most efficient means for moving large volumes of unitized loads is with carton clamps, an attachment that handles product without pallets. There is a wide spectrum of loads with different packaging types, box integrity, load size and weight, and each load requires an optimal amount of clamp force to prevent over clamping the load. This is where the challenge begins.

Genesis of the Touch Force Control System:

Recognizing how touch screen devices have become so ubiquitous, it became apparent to the author that Cascade might be able to utilize this technology to improve warehousing processes. As society has embraced the idea of touch pads in general, Cascade speculated that when drivers are faced with how to properly set the required amount of clamp force, they might be encouraged to interact with an intelligent device rather than 40-year-old mechanical technology.

Controlling Clamp Force - A Historical Perspective:

The lift truck is built to provide as much oil and hydraulic pressure needed for maximum capacity loads. To modify the maximum, in terms of hydraulic pressure and flow, the driver (or an automated system) must take specific actions. The driver can accomplish this using various mechanical systems, ranging from a simple three-

setting mechanical pressure regulator to fully automatic systems. With each, there are compromises that impact complexity, cost and effectiveness.

Methods & Devices to Control Pressure and Flow:

1. Driver Managed: The simplest and least expensive method of pressure control is to use no regulator at all and let the driver guess. Without any mechanical pressure relief products the driver partially pulls on the auxiliary handle (feathering) in an attempt to control the pressure and flow to the clamp. Not using any means of pressure control is rarely successful and always inconsistent. Furthermore, it most likely will cause product damage because it is extremely difficult or impossible to provide the level of accuracy needed to properly meet the clamp force guidelines established by the manufacturers of the product being handled.

2. Mechanical 3-Position Pressure Regulator: This is a simple and low cost device that allows the driver to change the auxiliary pressure sent to the clamp by moving a mechanical lever much like an automotive gearshift. The product has a total of three pressure relief settings. The challenge with this product, in addition to it having only three settings, is positioning the valve and handle in an ergonomic location that the driver can easily access. The valve design (which includes the handle) requires it to be plumbed into the lift truck hydraulic system, which is not in the driver's compartment. When positioned for easy hydraulic lift truck installation, the driver needs to reach and strain to change settings. If it's not easy to access, the driver will be less inclined to use it. As a result, the device is likely to be left in the high-pressure setting, which may not drop the load but consistently over clamps it. Leaving the pressure setting on high could be due to many factors including negative experiences with handling products on the low settings. Historically, the driver may have dropped a load after forgetting to move the handle to another setting or he just got confused as to which setting was appropriate. Getting confused about which setting to use is understandable when there can be 10, 20 or 30 load types that need different clamp force settings. Though it causes damage, drivers readily learn that leaving the handle on the high-pressure setting never drops a load.

3. Electronic 3-Position Pressure Regulator (Cascade EPR): The Electronic 3-Position Pressure Regulator, improving on the simpler mechanical version, is a leap forward in ergonomics. The hydraulic valve can be located near the lift truck hydraulics for easy hose routing, while the electronic switching mechanism can be remotely positioned near the driver. With improved ergonomics, there is greater success in having the driver utilize the device for changing hydraulic pressure and thus clamp force applied to the product. The standard product however, is still only available with three settings. The challenge remains for the driver to understand the algorithm of which clamp force setting to use with each product and load configuration and then remember to make the change.

Clamp Force Solutions of a Higher Order:

There are also more sophisticated products on the market that remove the driver from the equation. When these products can be configured to work with a facility's load configuration, they do an excellent job. Some measure volume (Cascade Volumetric Force Control - VFC), equating volume with clamp force. VFC requires no driver action and is an ideal solution when equal volume loads can accept the same clamp force. There are also products with discrete clamp force values for each unit load (Cascade Electronic Force Control - EFC), requiring the Warehouse Management System - WMS to communicate data with the truck-mounted controller on a real-time basis for all loads coming into and out of the warehouse environment. The real-time data gathering must be prior to clamping. The ability to successfully deploy this product is pending due to ongoing development of industry technology used in data capture.

Packaging Styles, Materials and the Correct Pressure Setting:

The fundamental challenge with existing methods of clamp force control has been determining which setting is needed. Most carton clamp applications require more than three settings. The packaging engineer optimizes the package design with many parameters, one of which is cost. A lower duty package is more cost effective when produced by the millions but requires more precise clamp force to prevent damage when handling. There are many different packaging styles and materials, such as corner bracing, Styrofoam or full corrugation, to name a few. There are other considerations for packaging, including display ready containers. With each packaging design or style there is the chance that the clamp force needs to change. It is clear that three settings are just not enough.

Driver Conformance:

The industry has attempted to enforce conformance to using the clamp pressure devices by using light bars indicating which pressure setting the system is on. Sometimes this works, other times it does not. For example, drivers might attempt to get around light bar monitoring by switching light colors in the system so higher pressure is shown as low. Since the carton clamp is designed to always hold pressure until the arms are opened, drivers could also clamp on the high setting and then immediately after clamping, set the pressure setting to the low setting so the lights are correct for the load and for the supervisor to see.

In the end, it is a continuous struggle to get buy-in from drivers to use the proper tools in order to get the job done correctly.

An Interactive and Visual Solution: TFC™ – Touch Force Control:

TFC™ – Touch Force Control resolves the issues associated with the mechanical methods of controlling clamp force and also bridges the gap between the mechanical versions and the technically advanced systems.

TFC™ builds on the growing trend of touch-based products, facilitating easy interaction with the system and

allowing the driver to consistently select and use the proper clamp force. With a minimum of training time (average 10 minutes) and one, two or three quick touches specifying the product category, the product type and the load configuration (quantity), the system then automatically activates the appropriate clamp force for the selected load. The driver never needs to remember which clamp force setting is needed for a particular product. In just a few touches, the driver chooses from the total of 486 potential pre-programmed choices without consulting charts or having to remember any settings. The system also eliminates the potential for the driver to use the higher pressure when in doubt.

How TFC™ Works:

The Driver Chooses:

Product Category -> Product Type -> Load Configuration -> System Automatically Confirms

1. Similar to other touch pad or icon-based devices, the driver interacts with an easy-to-use touch screen display. With a quick touch, the driver selects the Product Category, Product Type, & Load Configuration.
2. In 2-3 seconds, the driver has easily chosen from a total of 486 potential choices without the need for any clamp force knowledge.
3. This process is shortened for repeat loads, allowing the same product to be chosen again with one touch. The system again confirms the product for the driver.
4. The final screen then confirms all the choices and clamp force is automatically set.

Summary of TFC™ Features:

1. TFC™ is intuitive with a user-friendly interface.
2. Drivers like using the system with its interactive ergonomically placed touch screen.
3. Provides accurate clamp pressure control.
4. Drivers don't need to refer to charts for clamp force determination.
5. Is not limited to just three clamp force settings.
6. Accommodates 81 unique load types.
7. Accommodates 6 unique load configurations for each load type.

8. Short learning curve for the driver, normally less than 60 minutes.
9. System is customized for every customer's application with data specific to the loads being handled.
10. System can be programmed to jump from the Category screen directly to the Confirmation screen in just one touch, when product allows, which speeds up the process.
11. Ensures driver compliance by controlling the amount of time the clamp confirmation screen is active.
12. System has an optimization mode to facilitate quick and easy product clamp force determinations.
13. System includes a Datalogger that records the driver's every touch allowing management to validate the proper use of system.
14. Load Confirmation screen always assures that the driver confirms that the load he is picking up matches what is on the screen.

For additional information please contact:

Cascade Corporation at 1-800-227-2233 or visit Cascade online at www.cascorp.com.