The Benefits of Control Systems on Mobile Machinery

So, you have a choice. Do you design the newest revision of your brush mower using the same old hardwired relay logic that you have always used? Sure, your customers are asking for some more features, but is it worth it to change? It's gotten you this far without too many issues! Or, do you look at utilizing a control system made specifically for mobile machinery? Here are some reasons you should consider the latest mobile off-road and on-road control systems.

Improved Machine & Equipment Performance

Analog/PWM I/O – more precise control
For example, when controlling a boom with a joystick with on/off valves (bang/bang), the control can be jerky, and the boom can be difficult to maneuver. With a control system, you can utilize an analog or PWM output to a valve and ramp up the speed as you apply more joystick force. This ramping is easily done in software, and this can give you very precise control of the boom.

Ability to automate functions
When operating a machine, typically there are functions that need to be done in sequence. This can be difficult and complex when using relay logic. With a control system, all of these functions can be sequenced very easily with the software. In addition, the wiring is greatly simplified which makes troubleshooting that much easier.

Advanced diagnostics = less downtime
By designing diagnostic screens to fit your machine design, troubleshooting can be much easier than with relay logic. These screens can include things like I/O output status, and short circuit, and wire break detection on your field components. This allows you to find your issue quickly, resolve it, and get back to work.

Ability to save "recipes"/configurations
For example, there are times when there are multiple operators running a machine. One operator might like his machine set up one way, while another likes it set up much different. A simple example of this is the seat position in your car. With a control system, you can do something very similar with the set-up of a machine. These "recipes" can be saved for you, and for other operators operating this same machine. No more fine-tuning of the machine every time you jump into the cab to get some work done.

Custom operator interface
These operator displays can be tailored to your specific machine and your specific needs. In addition, these provide the method for getting diagnostic information from your vehicle. With the newest displays on the market, these operator interfaces can store wiring schematics, pdf

manuals, and with the new feature of being able to play videos, you can have access to videos showing you “how to” fix high maintenance items.

Customize component input devices such as joysticks
For more gradual control (ramping), an item such as a joystick can be custom configured. We can manipulate joystick response curves and instead of them being linear, we can change the curve to be less responsive until you apply more joystick “force.” For example, this can make your boom movements less “touchy,” and give you precise control over how your machine functions.

Data logging
For improved machine performance, and identifying when a machine is being operated outside of its design parameters, data logging can be implemented with control systems. When different events happen, such as operating the machine without the proper oil pressure, or at too high a temperature, these all can be logged in the memory of either the display or controller. This information can then be downloaded to some type of portable memory device which allows this to be analyzed. Not only is this valuable for your service department and warranty claims, but this can be used in the design stage of a machine.

Potential for remote monitoring
With the use of CAN-based control systems, your mobile machine can be monitored remotely. This includes downloading software updates, retrieving data logs remotely, disabling a machine that is operating outside of a given geography (geo-fencing), or just real-time monitoring. This can help limit your service expenses as you monitor a machine in real time from your office.

Easier, Quicker Production and Start-Up

Reduce and simplify wiring
Through the use of CANbus communications, the wiring is drastically simplified with a control system. This includes the wiring to the electronic engine, field devices such as valves and I/O blocks, and with the HMI operator display. No longer do you have to run individual wires out to devices, all of the devices can be distributed throughout the machine and connected via CANbus.

Pre-configured controllers / HMIs
Controllers and operator interfaces can be supplied with programs already preloaded so there is no configuring or downloading of software. Just provide the proper connections and you are ready to go.

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I/O feedback to check/verify wiring
As a part of the machine diagnostics, I/O feedback can be provided. This allows you to verify that the wiring is correct during production and start-up. No more getting the machine out in the field only to find out that a component is miswired in production.

Potential for "self-calibration"
Sometimes the theoretical machine operation (what was designed) doesn't match the actual machine operation. With a control system, machine outputs can be automatically set based on the "actual" machine operation. Also, each machine is a bit different in how the outputs respond. These can be easily "tuned" using a control system so that each machine reacts the same.

Engine / Transmission Controls

J1939 feedback, throttle control
When using a relay system, there is no way to communicate with modern electronic engines. Using a CANbus control system, this is done via the J1939 CANbus protocol. An example of this is being to manipulate or put limits on the speed (RPM) of the engine through the control system. Because the transmission also uses this same communication protocol, you can monitor and get feedback from the transmission.

DTC messages
Modern electronic engines provide messages to tell you about their status, how they are operating, what conditions they are seeing, and if there are faults. All of these messages are provided via CANbus. These messages can be captured and stored using a control system.

Tier 4 integration
Tier 4 represents the current emission requirement for diesel engines above 25Hp. These engines use different methods for meeting emission requirements, and all of them are electronic engines that can only be monitored by controls that communicate via CANbus.

Stall prevention
Because a control system can communicate with the engine and transmission using CANbus communications, if an operation on the machine causes the engine to "bog" down, you can easily change the operating conditions to prevent the engine from stalling. An example of that would be if you hit something with your brush cutter that binds up the cutters. The control system could automatically monitor the machine and increase RPM to a certain point to overcome this bind, and if need be, automatically disengage the cutter motor. This would be very difficult to do with relay logic controlling your machine.

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Easier to Maintain and Upgrade

Machine function changes are easier via software revisions
Let's say you get a machine out in the field, and your customer realizes that his operators like to run the machine at a lower speed for more control. This can easily be done by limiting the maximum RPM that the engine can be run at. A simple setpoint change can be done through the HMI that limits the rpm, and you are off and running.

Adding components is easier than having to "hard-wire" with relay logic
Adding components on a mobile machine control system with CANbus is very simple. This can be done by easily adding a component to an existing CAN I/O module and a change in the logic of the controller. If no CAN I/O module is available, one can be added for low cost and a minimal amount of wiring (4 wires).

Partner with an Electronic Controls Integrator

If you are building mobile equipment, consider the advantages of a control system made for on-road and off-road machinery. Yes, there will be a learning curve for implementing this into your equipment, and that is where Cross Company can help. We have been working with these systems for over 15 years. Let us become an extension of your engineering team!