# Berendsen's Roadmap to Modernisation

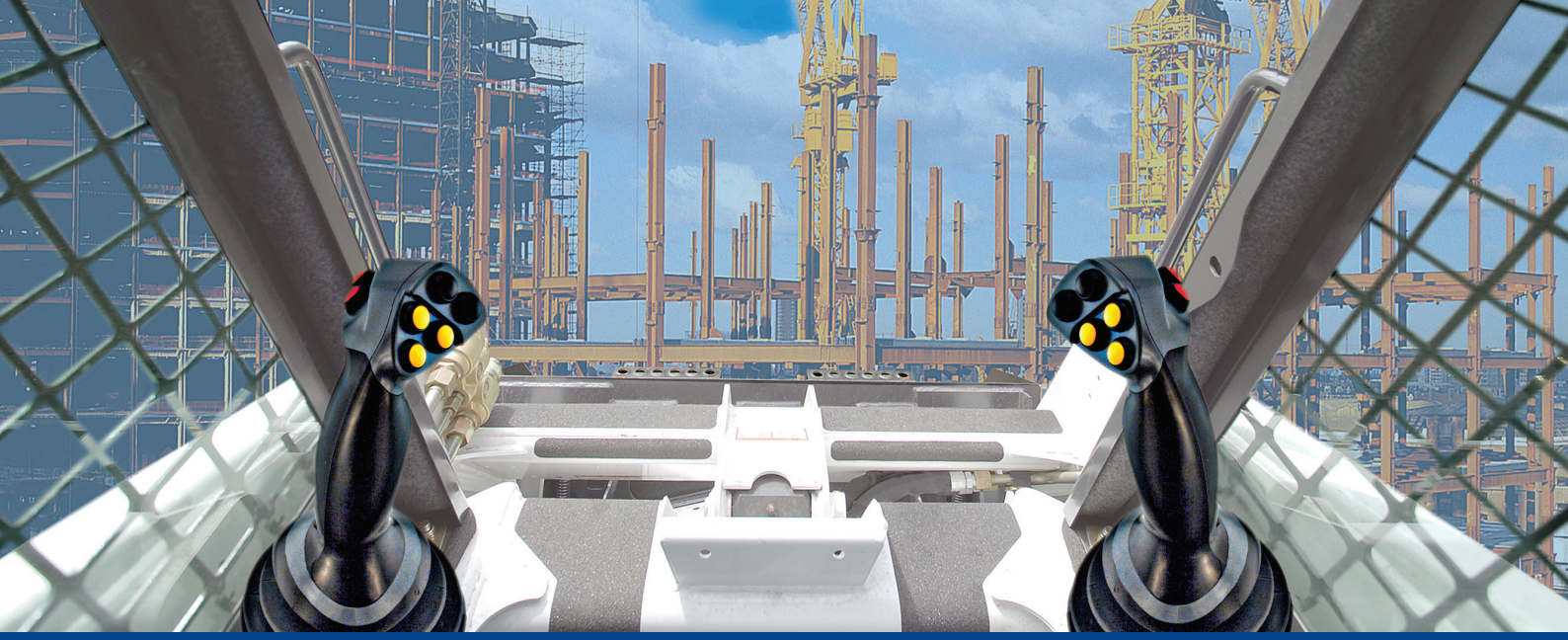
## Upgrading Legacy Hydraulic Machinery With Cutting Edge Danfoss PLUS+1® Machine Control Systems

| | |
|---|---|
| MORE | EFFICIENCY |
| MORE | PRODUCTIVITY |
| MORE | FUNCTIONALITY |

PLUS+1®

Danfoss

BERENDSEN FLUID POWER



# Table of Contents

# 1. Introduction

## The Surprisingly Smooth Path To Modernisation

Advancements in recent years have led to the simplification, modularisation and electronic integration of hydraulic systems that makes advanced hydraulic machine control a lot more accessible to companies of all types. Yet, many industrial operations across Australia are still running on outdated, inefficient machinery that has sometimes worked non-stop for decades. This archaic infrastructure is often difficult to maintain, slow and cumbersome and in some cases dangerous to operate.

Often the perceived cost and difficulty of upgrading holds business leaders back from adopting the latest technology. However, as you'll soon learn, the modernisation process can be relatively swift and surprisingly more cost-efficient than you think. This is thanks to the advancements in hydraulic machine control from Danfoss, with their innovative PLUS+1® machine control platform.

In this guide, we'll explore the path toward modernisation, demystify the new electro-hydraulic technologies available and discuss some of the mind blowing capabilities that they offer to engineers with the creativity and ingenuity to put them to work. We'll lay out a clear roadmap for industrial customers to upgrade outdated legacy hydraulic machinery to cutting-edge equipment featuring advanced electronic machine control systems.

By following this roadmap, you can enhance the efficiency, productivity, and reliability of your hydraulic systems, ultimately driving your business towards greater success. Let's get started!

# 2. Old Vs New

## How Machine Control Has Advanced

In the past, hydraulic systems were controlled by arrangements of custom-designed switches and relays that were rudimentary, took up a lot of space, were difficult to operate and hard to maintain. These systems were not only inefficient, but also lacked the ability to integrate with any other system, and would be hard to modify or upgrade or change in any manner if the need arose.

However, recent advancements in technology have led to the integration of programmable electronics which can be configured in infinite ways in order to achieve any design concept possible. This allows skilled engineers greater freedom to be creative and design elegant control systems for anything from custom drilling rigs, to specialised agricultural tools, or the high precision cutting machines used in manufacturing or anything else that needs customised control.

Danfoss PLUS+1® platform is the key to this new era in which upgrading hydraulic machinery is practical and affordable.

# 3. Danfoss PLUS+1®

## The Technology Behind Modern Machine Control

Danfoss PLUS+1® is the open secret that makes modern machine control possible, achievable and affordable. PLUS+1® is a modular, flexible, and scalable system that enables precise and intelligent control of hydraulic functions. It consists of hardware and software components that can be customised and combined to meet specific application requirements.

At the core of the system are programmable microcontrollers linked to different parts of a hydraulic machine to allow intricate and customisable actions to be performed. Microcontrollers are the central nervous system of the PLUS+1® platform. They are compact integrated circuits designed to govern a specific operation in a system. Each one has a processor, memory and input/output (I/O) peripherals on a single chip. These small, robust electronic components can be stacked, paired and configured in a variety of ways.

Using Danfoss' proprietary software, the engineer programs each microcontroller with a set of instructions to be executed at a given signal, or at a certain time or sequence etc. In other words, the engineer tells the microcontroller what to do and when to do it. It can tell an engine to change speed, tell a transmission to go backward or forward, or actuators to extend or retract - depending on the action that needs to be performed. Which means controls can be simplified and machine operation can be customised to perform any function with much greater accuracy and consistency.

# 4. The Benefits Of Danfoss PLUS+1® Machine Control Systems

The simplicity and ease-of-integration offered by programmable microcontrollers along with the integration capabilities of other modern hydraulic components makes upgrading existing equipment a much less costly exercise. Engineers no longer need to custom-engineer everything from scratch. Instead, they can build it up and use PLUS+1® guide software to adapt the system to their needs. This is opening up a whole new world of machines that can now benefit from better machine control.

## LOWER COST MACHINE CONTROL

The Danfoss PLUS+1® system is opening many doors and lowering the barrier to entry for people who want more advanced machine control for their hydraulic equipment. In the past, if you wanted a machine to perform a specialised action, the hydraulic system would usually need to be designed with a high level of customisation. Necessitating a long and costly design process.

## SIMPLICITY

The system allows machine control to be achieved in a very efficient manner, without occupying a large amount of space in the system. Before, engineers would probably need to use a large number of relays to achieve the machine control they desired - and this would often mean a big panel with multiple inputs. With PLUS+1®, the system can be simplified and tucked away. Allowing for more freedom to design the rest of the machine and optimise it for the task without compromising.

## RELIABILITY

The system is very robust and dependable and eliminates the need for delicate motherboards or sensitive connectors which are vulnerable to dust or moisture. This makes it perfect for use on mines, farms, industrial sites and other extreme environments.

## FLEXIBILITY

The system is highly modular. Microcontrollers can be arranged and programmed to perform an infinite variety of actions. And there are many options for displays, computer inputs, joysticks, etc.

The Danfoss PLUS+1® control platform is a powerful technological solution offering incredible opportunities to improve countless applications. With Danfoss PLUS+1® it's now much easier and more affordable to upgrade or replace archaic systems and replace these with more modern, more reliable and easy to use machinery that makes work more efficient and less frustrating.

# 5. Berendsen's Roadmap To Modernisation

Now that you understand the technology, it's time to outline the essential steps for industrial customers to upgrade their outdated legacy hydraulic machinery to cutting-edge equipment featuring advanced electronic machine control systems. By following this roadmap to modernisation, you can make the transition smoothly and start enjoying greater efficiency, better operation and higher productivity.

## ASSESSMENT OF CURRENT HYDRAULIC SYSTEM INEFFICIENCIES

The first step in modernising your hydraulic machinery is to conduct a comprehensive assessment of your current equipment. We will evaluate the performance, reliability, and maintenance history of your legacy hydraulic systems to establish a clear understanding of the areas that need enhancement. We'll identify the inefficiencies, limitations, and areas that require improvement. Common issues may include outdated control systems, low energy efficiency, excessive noise levels, inadequate safety features, or obsolete components.

## DEVELOPMENT OF NEW DESIGN CONCEPT

Once we have identified the inefficiencies and limitations, it's time to develop a new design concept. This is where you will collaborate with Berendsen's hydraulic engineering experts to formulate a design strategy that aligns with your specific requirements and industry standards. We'll consider factors such as improved energy efficiency, enhanced performance, increased safety, and ease of maintenance. The new design concept will incorporate advanced electronic machine control systems and enable precise control, data monitoring, and automation capabilities where possible.

## HYDRAULIC ENGINEERING USING COMPUTER SOFTWARE MODELLING & FEA SIMULATION TESTING

Next, we will utilise computer software modelling such as Automation Studio to optimise the hydraulic system design. Hydraulic engineering software allows for virtual prototyping, system optimization, and performance prediction. By simulating various operating conditions, our engineers will fine-tune the system design. We'll identify optimal component configuration and material construction, identify potential bottlenecks or inefficiencies, and validate the performance of the upgraded hydraulic system.

## PRECISION MANUFACTURING OF CUSTOM COMPONENTS

In certain cases, the modernization process may require the development of unique components tailored to your specific needs. To this end, new components will be manufactured in accordance with the engineer's specifications to meet the required quality standards, performance specifications, and compatibility with the advanced electronic machine control systems.

## FABRICATION AND BUILDING OF NEW HYDRAULIC SYSTEM

With the design concept finalised and custom components ready, it's time to proceed to the fabrication and building phase. This is where it's crucial to work with fabricators and hydraulic system integrators with the skills and experience in constructing and integrating complex hydraulic systems. The fabrication and assembly process should adhere to industry standards, quality control procedures, and safety regulations.

## FACTORY ACCEPTANCE TEST

With the fabrication and assembly stage completed, the system or its major components undergoes a series of comprehensive inspections and tests to ensure it meets all specified requirements. This process involves meticulous scrutiny of the equipment to identify any visible defects, verify proper installation, and ensure adherence to safety standards. Additionally, various operating scenarios and stress tests are performed to guarantee correct functionality and achievement of the desired performance levels. This proactive approach allows potential issues to be promptly addressed, thereby saving time and costs during the commissioning and start-up phase. Thorough documentation is generated to record all test results, any identified issues, and their respective resolutions, which is of utmost importance for traceability and future reference.

## INSTALLATION AND COMMISSIONING

Once the new hydraulic system is fabricated, it's time for installation and commissioning. Berendsen's experienced hydraulic technicians ensure the proper installation and integration of the upgraded equipment into your existing infrastructure. Rigorous testing and verification is performed to validate the system's performance, functionality, and reliability. Tests are conducted under various operating conditions to evaluate system responses and make any necessary adjustments to achieve optimal performance.

# 6. Berendsen's Engineering & Manufacturing Capabilities

## Putting the power of PLUS+1® to work

Upgrading legacy equipment effectively and efficiently is a painstaking dance between engineering and manufacturing. This is where Berendsen is uniquely positioned to ensure the success of any upgrade project. Our comprehensive in-house capabilities enable us to move from concept to design and manufacture in an end-to-end process while keeping a sharp eye on quality control. Ensuring what is created on paper is realised in the real world.

### WORLD CLASS HYDRAULIC ENGINEERING DIVISION

Berendsen's world class hydraulic engineering team has many prestigious projects under its belt. From designing precision airframe test-rigs for the airforce to retrofitting underground mining equipment with the latest machine-control system, our engineers have the skills and knowledge to put the power of Danfoss PLUS+1® to work for you.

### INVENTORY OF DANFOSS PLUS+1® COMPONENTS

As a tier 1 distributor of Danfoss products, Berendsen's warehouses are fully-stocked with all necessary components to bring any design to life. From the microcontrollers that are the brains of the system to the complex proportional valve groups that can be assembled in endless configurations, we have what is needed to make any system possible.

### STATE OF THE ART CUSTOM MANUFACTURING DIVISION

Our custom manufacturing facility located in Newcastle NSW is home to an array of precise computer-controlled CNC milling machines. Here, our experienced technicians work closely with our engineers to manufacture all required components and build up systems in an end-to-end process that ensures the highest quality end product.

### NATIONWIDE DANFOSS ACCREDITED BUILD CENTRES AND SERVICE CENTRES

Finally, Berendsen offers nationwide service and support through our extensive network of 10 branches. With Danfoss accredited build centres and repair centres offering certified product builds with fully warranty support from the manufacturer.

# 7. When To Consider Modernising

So, what legacy equipment would benefit from upgrading to the latest machine control systems? Any machine that is difficult to operate or takes an unreasonable amount of attention to calibrate, run or train people to use is a possible candidate. Here are some points to consider.

## OUTDATED CONTROL INTERFACES AND FUNCTIONALITY

Legacy control systems often have complex interfaces that are challenging to navigate and limit the range of control options available to operators. Upgrading to the Danfoss PLUS+1® machine control systems provides intuitive interfaces and advanced features that enable operators to have precise control over the machinery, improving overall efficiency and reducing operator errors.

## DIFFICULTY INTEGRATING WITH NEW TECHNOLOGIES

If your current machinery struggles to integrate with newer technologies, it's a strong indication that an upgrade is necessary. Danfoss PLUS+1® machine control systems are designed to seamlessly integrate with a wide range of components and technologies. Whether it's integrating with IoT devices, implementing wireless connectivity, or utilizing advanced sensors, upgrading to the latest Danfoss system ensures compatibility with the latest industrial advancements.

## RISING MAINTENANCE AND DOWNTIME COSTS

Outdated control systems often lack advanced diagnostics and predictive maintenance capabilities. Upgrading to the Danfoss PLUS+1® machine control systems equips you with remote monitoring capabilities, enabling you to proactively detect potential issues, schedule maintenance more efficiently, and reduce downtime costs significantly.

## INEFFICIENCIES AND PRODUCTIVITY LOSS

Do you often face inefficiencies and productivity loss due to outdated control systems? If so, it's time to consider an upgrade. By reducing human errors, automating repetitive tasks, and streamlining processes, these systems can significantly enhance productivity, improve product quality, and drive overall efficiency gains.

# 8. Applications That Benefit From Modern Machine Control

When it comes to industrial machinery, modern control systems can be applied in various specific applications requiring precise hydraulic control. Here are some more specific examples:

## HYDRAULIC PRESSES

Hydraulic press systems used for various industrial processes like metal forming, stamping, moulding, and assembly can often benefit from more accurate control of hydraulic cylinders, pressure, and speed to achieve desired results.

## INJECTION MOLDING MACHINES

Injection moulding machines using hydraulic systems to inject molten plastic into moulds can benefit from precise control over the injection process, ensuring accurate pressure, temperature, and timing for consistent and high-quality production.

## MACHINE TOOLS

Modern machine control can be integrated into hydraulic systems in machine tools to enable precise control of tool movements, clamping, indexing, and other hydraulic functions, contributing to improved machining accuracy and productivity.

## INDUSTRIAL ROBOTICS

Industrial robots require precise and synchronised movement control. Whether it's handling heavy loads, precise positioning, or complex motion sequences, modern machine control ensures smooth and accurate hydraulic control for enhanced automation.

## MATERIAL HANDLING AND CONVEYING SYSTEMS

Industrial machinery involved in material handling and conveying applications, such as conveyor systems, palletisers, and sorting equipment, often rely on hydraulic control for smooth operation. Modern machine control systems enable precise operation of hydraulic actuators and valves, optimising the movement and flow of materials.

## METAL CUTTING AND FORMING MACHINES

Metal cutting and forming machines like shears, bending machines, and tube bending equipment can also benefit from precise control of hydraulic cylinders, valves, and pressure to achieve accurate cuts, bends, and shapes in metal fabrication processes.

## TEST STANDS AND SIMULATORS

Modern machine control systems can be employed in hydraulic test stands and simulators for precise control of hydraulic actuators and valves to simulate real-world conditions and accurately measure performance parameters.

## INDUSTRIAL AUTOMATION AND CONTROL SYSTEMS

Computer controlled hydraulic systems can be integrated into industrial automation and control systems like assembly lines, production machinery, and process control systems, where precise hydraulic control is required for efficient operation.

These are just a few examples of how modern machine control systems can enhance the operation, functionality and efficiency of specific industrial machinery applications. The flexibility and scalability of today's systems make it adaptable to various hydraulic control requirements, contributing to improved industrial processes.

# 9. Conclusion

## Modernise With The Premier Danfoss Distributor

If you're looking for enhanced productivity, more efficiency and a safer, more worker-friendly hydraulic system, Berendsen's engineers are ready to develop customised machine control systems for virtually any application.

Our premier distributor status allows Berendsen to incorporate PLUS+1® components into designs including programmable microcontrollers and human interface devices such as displays and joysticks and provide these as part of a custom hydraulic solution. Whatever your machine control needs, Berendsen is ready to put Danfoss PLUS+1® technology to work for you.

Not only that, Berendsen stands ready to make sure the transition to modern machine control is as swift and efficient as possible. Our motto "every second counts" reflects the way we respond to customer needs and deliver a service experience that Danfoss customers expect from a global brand. Whether it's designing systems, supplying products, or supporting customers with our depth of knowledge, breadth of services and 360 backup, if you're looking for Danfoss solutions, you can expect a customer experience that is powered by Berendsen.