



## Chain Cleaning & Oiling System

### Meat & Livestock Australia Technology Transfer Kits

*This Technology Transfer Kit is one in a series of Do-It-Yourself (DIY) resources prepared for the Australian meat industry to encourage the development of project engineering skills at meat processing sites while implementing simple but useful items of technology. This kit is designed to provide the essential information to allow processors to carry out suitable modifications and installations at their own sites to improve some aspects of their processing performance. As each processing site has unique design and construction features the information in this kit should be used as a guide only. Some modifications from this kit to ensure the successful application at individual sites are likely. No warranty is given on the outcome of the use of this kit or the information it contains.*

### DIY Kit # 9 – Chain Cleaning & Oiling System

Dirt grease and animal fat builds up on the overhead chains used for transporting carcasses through abattoirs. These contaminants can build up over a period of time and later drop onto passing carcasses. A significant source of this build up is the excess of oil and grease resulting from chain lubrication and infrequent cleaning. Chain cleaning is a labour-intensive job that requires cleaners to high-pressure spray and manually brush the chain. After cleaning, the chain will need to be relubricated to prevent corrosion and excessive wear. As the chain is mounted well above floor level, cleaning often takes place from ladders or from the overhead support structure. This can be a safety hazard.

A system has been developed to reduce, or eliminate, the manual requirement to clean the chain and the need to access the chain from ladders and overhead support structures. The system is made up of three components. The first is a cleaning unit to spray the chain with high-pressure water to remove excessive build-up of hardened grease and oil that could fall from the chain. The second is an air blast unit that removes excess water from the chain to minimise opportunities for corrosion and ensure effective re-lubrication. The third component is an automatic chain lubrication system.

These units are designed to work together as a complete chain cleaning system and can be used in conjunction with a rail cleaning system driven by the conveying-chain and described in DIY Kit 8.

These cleaning units have been trialed in an export abattoir and have proven successful at cleaning conveying chain that has a level of build up normally encountered with a routine periodic cleaning program.

### Description

#### Chain Washer

The chain washer unit consists of a high-pressure water unit pumping water directly through two descaling nozzles. The nozzles are mounted one either side of the chain to obtain maximum contact. As pressure-washing equipment is available from a range of manufacturers and suppliers, there is likely to be a range of suitable equipment available. The final choice of equipment may depend on the availability of equipment and servicing in the local area.

The pressure washer unit successfully trialed in an export abattoir is a Gerni 208 Jet. This was selected because of its compact construction and ability to achieve a pressure of 85 bar. The pressure washer is powered by 240 volts mains supply and is fed by mains pressure water. Pressure washers have the facility to draw chemical agents such as foamer, degreaser or dewatering fluid into the high-pressure water stream. This has not been found to be necessary from trials as an adequate result can be achieved with water alone.

The nozzle used is a descaling type and this will produce a narrow flat fan of water. They are specifically designed to remove grease, oil, scale and other surface deposits from a range of hard surfaces. This type of nozzle is readily available from most spray nozzle suppliers.

The pressure pump is mounted on the overhead chain mounting structure with the nozzles located approximately 30 mm from the chain. Water force from the nozzles reduces rapidly with increasing distance so it is important to position the nozzles as close to the chain

as possible. A stainless steel cover encloses the unit when in use to control overspray onto other surfaces and to ensure that any loosened soil falls down from the chain.

### Chain Drier

The chain drier unit consists of four air-blast nozzles, two each directed at either side of the chain. The nozzles are connected directly to the compressed air supply on the slaughterfloor. The air blasts are mounted approximately 600 mm down stream from the high pressure water cleaner to allow most of the free run water to fall from the chain prior to air drying. The stainless steel cover of the washer unit is extended to include the air blast drier. This will control overspray onto other surfaces and ensures that any residual free water and loosened soil falls down from the chain.

### Chain Oiler

The automatic chain oiler system is designed around a Jaco air operated lubrication pump. This unit sprays a fine air/lubricant mist directly onto the chain. The unit consists of an oil reservoir, two variable output lubricant pumps, two air/lubricant mixer nozzles and a single level-action pneumatic control valve. Air supply to the unit is from the compressed air supply on the slaughterfloor. A pressure of between 3.5 and 8 bar is required.

The nozzles are mounted in a frame that incorporates a drip tray to catch any excess lubricant and prevent it from falling to the floor where it could pose a safety hazard. A simple drain could be fitted to recover and dispose of excess lubricant. The chain oiler unit is mounted under the main chain bearers and around the chain. The mounting of the spray nozzle assembly is shown in Diagram 1. The pumps and lubricant reservoir are mounted on an overhead walkway or in the ceiling space to provide safe access for maintenance and addition of oil to the reservoir.

As each link of the chain passes the pneumatic control valve the control valve lever activates the unit and an air pulse is sent to the lubrication pump cylinders. Each pump is a fixed stroke air cylinder connected to the pump plunger. The pneumatic signal from the control valve pressurises the cylinders connected to the pumps firing a shot of lubricant through each nozzle together with air, spraying the lubricant over the chain link. A schematic drawing showing the arrangement of the components in the Jaco lubrication system is given in Diagram 2.

The amount of lubricant is controlled by the position of the cylinder and plunger through an adjusting nut. The lubricant pump output can be adjusted from zero to 0.3 ml per stroke. With a lubricant reservoir of 11 litres operating at the maximum of 0.3 ml per stroke per pump, sufficient lubricant can be held to treat some 2,750 metres of standard chain with links at 150-mm centres.

Lubricant used for the trials at the export abattoir was Ralcor food grade oil. Other food grade oils are suitable. Some adjustments to pump and nozzles may be required to accommodate different viscosity lubricants.

The lubricating unit is mounted down stream from the washer and drier units and is again enclosed in a stainless steel cover to control overspray onto other surfaces. Positioning of the three units is shown in Diagram 3.

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## Benefits

Benefits obtained by using the chain cleaning system are:

- Cleaners are not required to climb up ladders or onto overhead support structures and carry out difficult manual cleaning activities. As a result there is a significant reduction in Occupational Health and Safety risk
- The washer unit effectively removes all oil and grease hardened particulate materials but does not remove all traces of oil and grease. After washing a thin film of oily material remains. This minimises the risk of corrosion and excess wear should the lubrication system not perform as required.
- Increased productivity of cleaning staff is obtained through reduced operator manual activity. Some modifications may be required to accommodate variations in chain guides and hook carriers. In some situations these may still require some manual cleaning.
- Improved consistency of cleaning is achievable, as the action is not limited by the access of the operator to the chain.
- More regular cleaning is achievable, for the same cost and effort, as the labour component is virtually eliminated. As a result the overall hygiene of the chain is improved. This improved chain hygiene should give a flow-on reduction in contamination of carcase meat.
- Regular cleaning and lubricating can significantly reduce wear and the incidence of rust on overhead equipment. Costs for maintenance and removing this rust are likely to be significantly reduced.

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## Cost:Benefit Analysis

A budget cost of \$3,400 per unit has been established for the chain cleaning and lubricating system. Based on a savings of some 16 hours of cleaning time and some 4 hours of lubricating time, a cost:benefit analysis has determined a payback period of under two years at plants that currently clean on a three monthly cycle. A more regular cleaning cycle will result in a quicker payback

This analysis only takes into account the capital cost of the equipment and the labour for cleaning activities. No value has been established for OH&S improvements, savings in reduced maintenance and rust treatment or the value of increased hygiene. Inclusion of these items would be expected to dramatically reduce the payback period further.

All cost:benefit analyses have been done on the basis of one fixed unit per chain. As plants often have up to 8 chains, over several processing areas it is feasible that the chain cleaning/lubrication system be constructed as a portable unit and moved from chain to chain as required. Capital cost would be expected to be slightly higher for the portable unit and some time required relocating it. However the use of a single unit would give a very reduced payback period.

## Diagrams

Diagram 1. Arrangement and positioning of the lubricator nozzle and drip tray, with the cover removed.

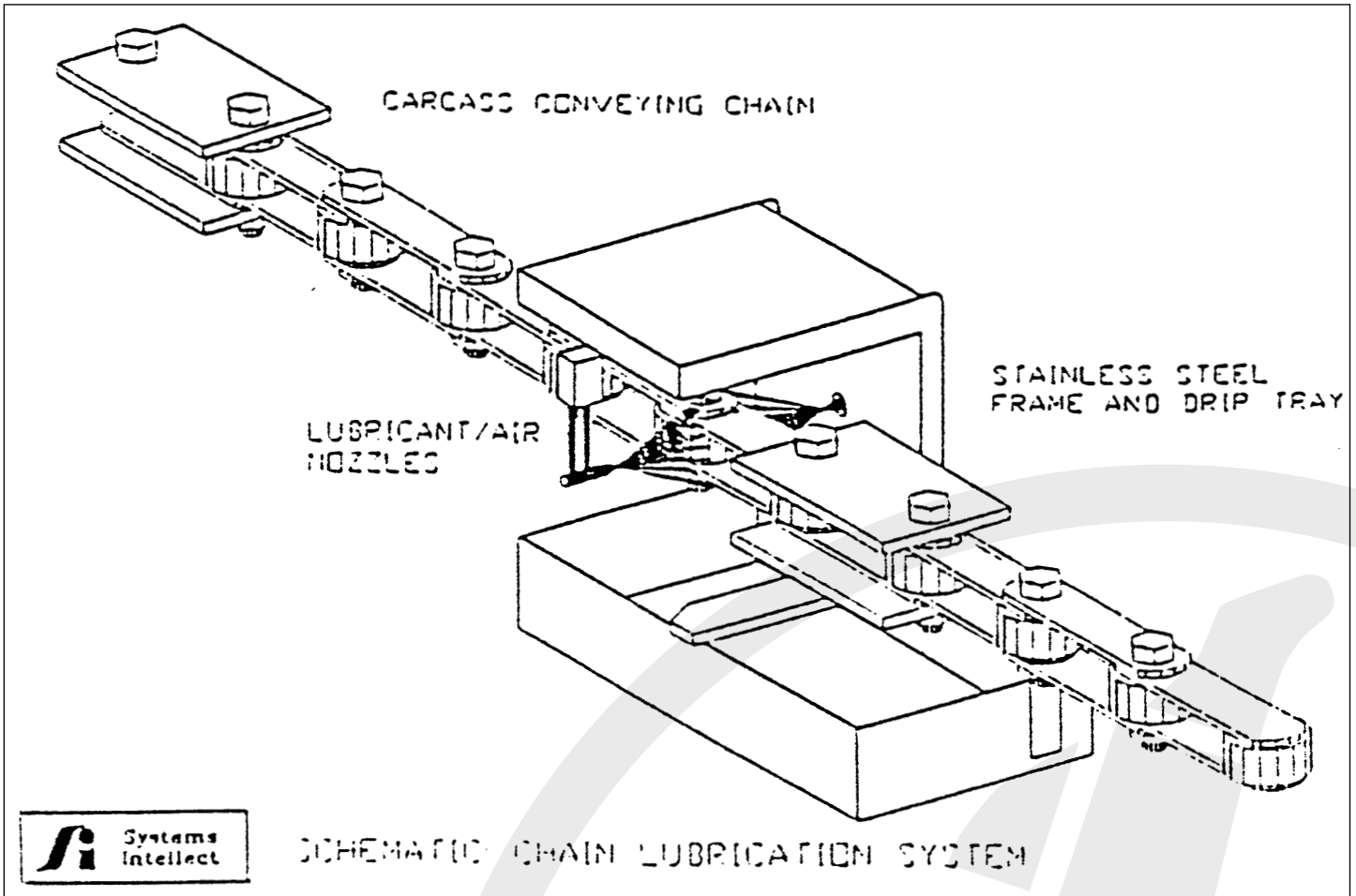


Diagram 2. Schematic drawing of Jaco lubrication system.

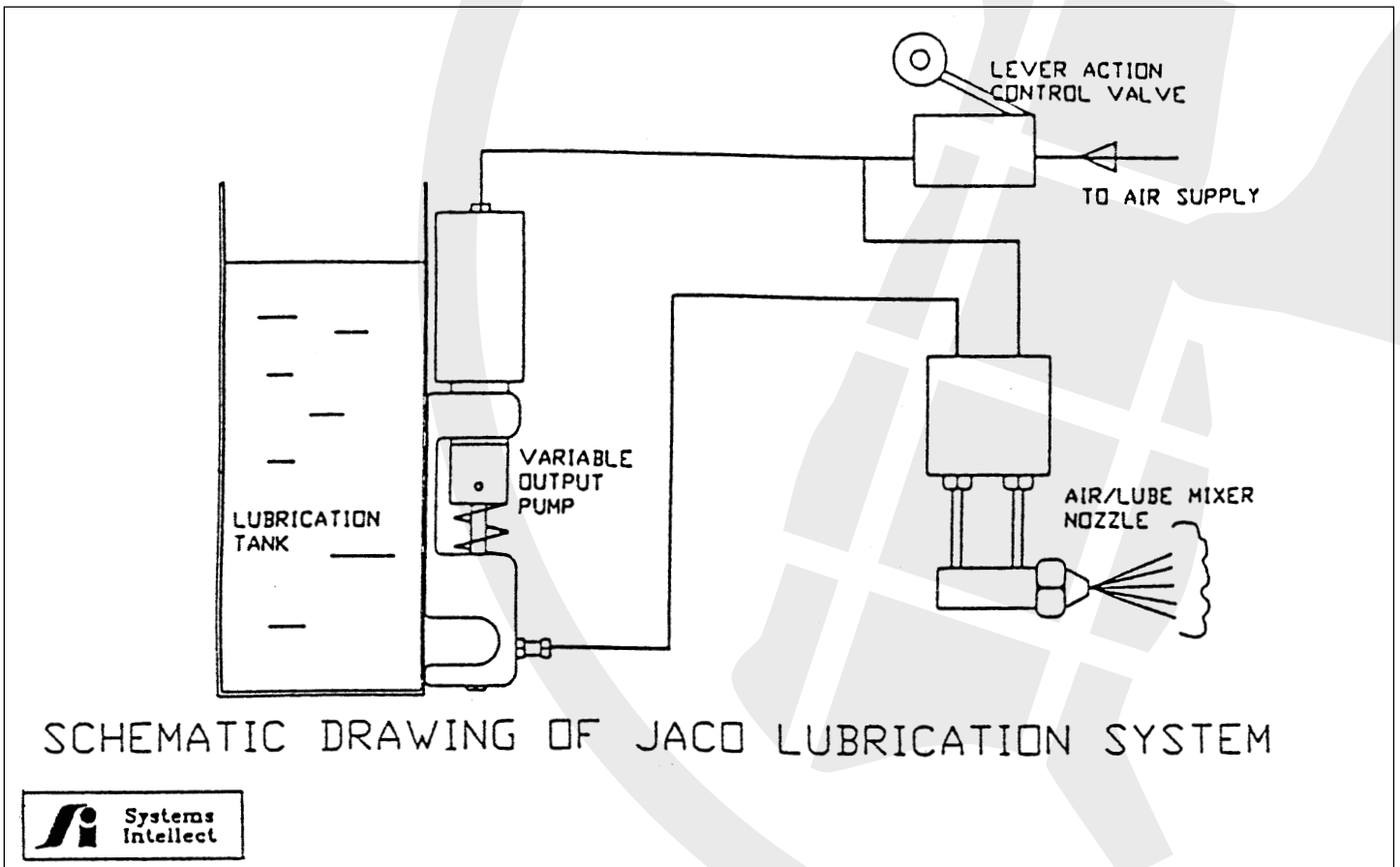
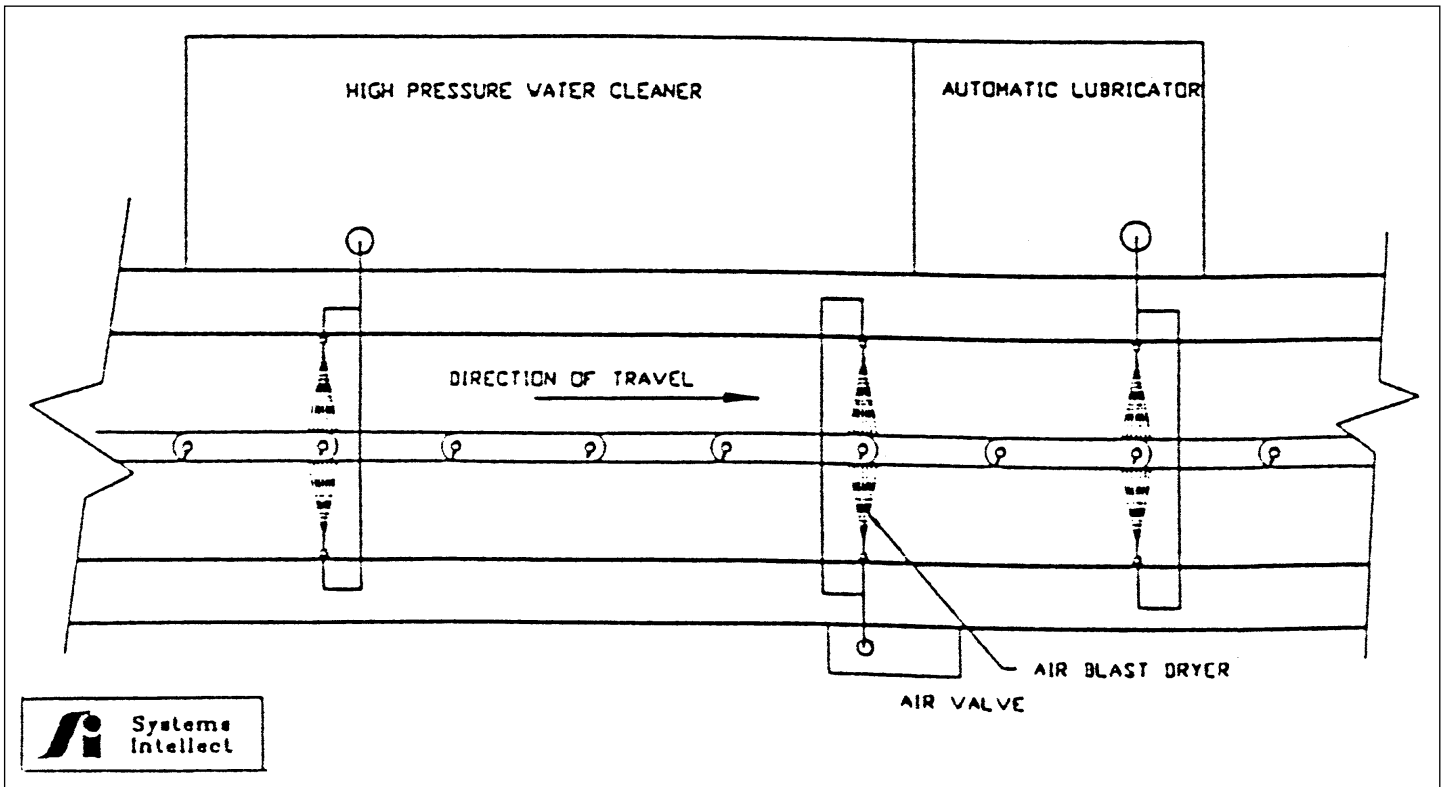


Diagram 3. Arrangement of the washer, drier and lubricator components of the chain cleaning system.



## Commercial Component Information

### High Pressure Washer

The high-pressure washer unit used in the trials is a Gerni 208 Jet Turbo Laser pressure cleaner manufactured and supplied by Powerclean. Suppliers of Gerni Powerclean equipment are located in most States.

### Lubricator

The lubricator used in the trials is a Jaco "One Shot" Lubricant Spray System manufactured by Jaco Engineering, Edwards Rd, Erdington, Birmingham, B24 9EP, England. Jaco's Export Sales Office is at 1-3 High St, Upnor, Rochester, Kent, England.

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*Equipment design and development*

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