ANNEX I

Foreword

Vezzani shears, PC/AC type, result of a long experience and uninterrupted R&D activity in scrap processing, are the evolution in design and technology of a range of machines carrying the name of Vezzani in scrap yards all over the world, from the traditional PC type to the innovative “Continuous Feeding” shears, PC/AC type. Owner of both technologies (traditional and PC/AC) Vezzani is in the unique position to have from its own experience the knowledge to make a real comparison, so to express an opinion based on more than fifty years of making and servicing scrap processing equipments.

This unmatched experience led Vezzani, as well as so many Users of this kind of shears, to acknowledge the PC/AC as the more efficient and profitable way to process scrap.

Basic element in Vezzani design and technology is the “Heavy Duty” design, combined with the most severe environment conditions, paying special attention to easy exploitation and servicing. As a result of this attitude all parts subject to wear are lined with elements easy to replace, the main frame and the housing of the moving parts are designed to hold heavy loads, static and dynamic, without deformation, and again the “user friendly” technology is widely used.

The same evolution in scrap nature and feature guided the Vezzani design leading to a configuration proved to be the more efficient to process voluminous “tout venant” as well as HMS1 from industrial or heavy transport demolition.

The most innovative feature of the PC/AC type, as recalled in the name itself (PC/AC stands for “Pressa Cesoia ad Alimentazione Continua” i. e. Precompression Shear Continuous Feeding), is the actual “***automatic***” mode, requiring no specific operator at all thanks to the total independence of the press and cut action from the feeding activities.

PC/AC concept

Precompression shears are so called because the scrap is deformed and pressed before being cut. In traditional (horizontal) shears the scrap is pressed inside a box which dimensions have to match the length, width and height of the scrap to be processed. Inside the box mobile elements move and press the scrap making the box highly complex and technically elaborated. Vezzani innovation with PC/AC concept has been to make the box simply an “hopper” leaving the scrap sliding down towards the main frame where it will be pressed and cut. The typical “open end” shape of the box allows any length of scrap to be processed.

So the box is no more an issue in maintenance, hydraulic failures, service, parts, down time …great saving in maintenance costs and greater process efficiency.

The descent of the scrap toward the press and cut zone is made by gravity, so it is possible to feed the box any moment of the cycle making the PC/AC shear totally and actually self-governing able to operate continuously without any dedicated operator, only requiring a steady flow of scrap to be put in. All the actions on the scrap (pressing, deforming and cutting) are concentrated in only one element, the main frame, greatly reducing the surfaces wearable, increasing the pressure over the scrap getting higher deformations and higher density than from traditional (horizontal) machines. The great pressure over the scrap and the absence of the “bundle up” effect as it happens in horizontal charging box makes the scrap sheared in Vezzani PC/AC shears singularly dense and free so to become a reference standard in scrap industry. In United States and United Kingdom is defined V1 scrap (Vezzani1) the HMS1 scrap processed in Vezzani PC/AC type because the bulk density is higher allowing higher loads for the electric arc furnaces charging baskets, as well as in ships, trucks, and handling devices.

PC/AC main features

Mechanic

Main frame

It is the structural heart of the machine. Shaped as a continuous portal frame made in welded steel it anchors the whole machine to the foundations, through anchor bolts, handles and guides the moving rams and the guillotine, holding the static and dynamic loads coming from scrap process activities. This complex geometry has the great advantage to be highly compact, concentrating in one body only the complete kinematic of the machine; the machining is done on the whole assembled body, achieving better precision, in shape and dimensions, of the coupling surfaces; maintenance is better and parts are easier to replace. It is made of steel plates, certified, direct supply from leading European steelwork, their high thickness ensures a great stiffness, needed to get the best dynamic of the moving parts, although in combination with the heavy loads due to scrap processing. Welded joints are tested and certified in order to ensure the high quality standard required.

Charging box

Designed to collect the scrap and to lead it, by gravity, toward the front part of the machine where are located the pressing rams and the shear. It is made as electro welded steel structure, shaped as a slope, and the bottom is divergent in order to avoid any scrap hanging to the side walls. It is lined with wear resistant plates hold mostly by trough bolts.

Side ram group

The side ram, moved by a double action hydraulic cylinder, pushes the scrap laterally forcing it in the narrow area under the clamp, as required by the width of the cut throat. The shape of the ram is such that

the action on the scrap is progressive with maximum pressure closer to the cut throat. The range of the stroke comes from the “Work Program” selected by the operator, through the local control panel or the remote control, according to the scrap being processed. In case of no or little need of side deformation the stroke can be reduced, even down to zero, increasing the cycle speed of the machine. The reduced surface (in comparison with traditional machines) and the high force of the cylinder provide a singularly high pressure on the scrap, more than twice than the traditional machines, leading to a higher density and deformation with fewer wearable parts. Either the ram and its housing are lined with wear resistant plates, bolted. The sliding surfaces are lubricated by the centralized auxiliary lube system, fill with standard quality grease, which functionality is controlled and monitored to the operator’s panel.

Clamp group

The clamp, moved by a double action hydraulic cylinder, presses down the scrap, increasing its density, and holds it while the shear is cutting. The ram is shaped with reverse steps suitable to deal with voluminous scrap, up to three times higher than the stroke of the ram itself. The shape of the ram is such that the action on the scrap is progressive with maximum pressure closer to the cut throat. The range of the stroke comes from the “Work Program” selected by the operator, through the local control panel or the remote control, according to the scrap being processed. In case of little need of vertical deformation (as in case of beams, rail tracks, skeletons, and so on …) the stroke can be reduced, increasing the cycle speed of the machine. The bottom plate of the clamp, exerting the maximum pressure on the scrap is made of high alloy armor plate, hold by a set of snap off head bolts. The reduced surface and the high force of the cylinder provide a singularly high pressure on the scrap, leading to a higher density and deformation. Either the ram and its housing are lined with wear resistant plates, bolted. The sliding surfaces are lubricated by the centralized auxiliary lube system, fill with standard quality grease, which functionality is controlled and monitored to the operator’s panel.

Shear group

The shearing unit is the most important part of the machine and the one with the higher loads involved. Made from alloy casted steel it holds the set of knives (upper) that in combination with ones installed in the main fame (lower) cut the scrap held by the clamp. It’s equipped with a pre-cut bar that, first to hit the scrap, establishes a bending condition that helps the following cut and, quite often, just breaks the brittle scrap itself. It moves inside a portal frame, fully welded and ring closed to remain rigid regardless the heavy load coming from scrap processing. All sliding surfaces are in special steel, lubricated from the main lube system, fed by graphite top Heavy Duty type grease. Any failure in this lubrication will stop immediately the machine and warns the operator. The wear of the guides can be easily compensate by adjusting the position of the gibs rotating the eccentric holding the gibs.

Hydraulic cylinders

Only three main cylinders are enough for the PC/AC type shear; plus the sizing door cylinder, structurally alike but much smaller. All made by Vezzani, take advantage of the long “on field” experience of Vezzani. They are all double action, with inside surfaces honed and rods chrome plated; dimensioned and equipped to hold the most severe environment conditions with minimal maintenance. The load on front gaskets can vary to compensate the seal wear; new design bushings ensure very long life for bushings, rod and barrel. All cylinders are equipped with inside position sensors, key element to manage the adaptative hydraulic system to get the best velocity and the best running softness.

Knives (upper and lower)

The knives, often called also blades, upper and lower are the result of a long and exhaustive test campaign on materials, heat treatment, geometries made by Vezzani and some top Client for years. Vezzani achieves to an exceptional quality of knife combining wear resistance with high resilience. All knives are held by through bolts, easy to install and to replace with a specific hydraulic device, supplied with the machine. Into the main frame and the guillotine a set of specific devices, hydraulic, make easy the middle knives extraction.

Gibs and shear guides

The gibs are the main support for the guillotine, they hold its weight (partially, as it happens because the inclined position) and, more important they guide the shear in the movement and hold the loads coming from cutting scrap. They are made in special forged steel machined in order to house the replaceable guides that face the relevant installed in the guillotine. The “eccentric type” connection with the main frame allows an easy and precise adjustment of the gibs position in order to compensate the wear of the guillotine guides.

Sizing door group

This is the mobile device that facing the scrap sliding down in the charging box stops it in a pre-set position fixing the cutting length. The door is anchored to the main frame structure. The movement of the sizing door is synchronous with the guillotine and it is driven by a double action hydraulic cylinder. The door position, can be modified by the operator selecting one of the pre-set cut length according to the process needs directly from the PLC.

Outlet slope

The outlet slope is part of the foundation and appears in the set of drawings supplied with the machine. It collects the scrap sheared by the machine and lets it sliding toward the down stream devices (pit, conveyor, cleaning system, …).

Hydraulic, electric system, lubrication system

Hydraulic station

A single structure, held by a steel frame, houses the hydraulic oil tank including the filter chamber, the main power groups, the auxiliary hydraulic groups, the distribution and control groups, cooling and off-line filtering system. The adaptative hydraulic design (variable displacement pumps electronically controlled, proportional distributor with feed back control) together with the more recent electronic control system (PLC) gets to a high commutation speed, combined with high velocity of the cylinders to achieve high performances with smooth and shock-less operation. The tank design and outside piping layout are designed and built to minimize the section and direction changes with a significant foam reduction as well as reducing the loss of head. The hydraulic pumps and electric motors are made by leading brands according to the most recent standards in order to increase the efficiency reducing energy consumption and noise emission.

Oil and air filter system

The "high tech" hydraulic requires oil with a level of contamination significantly low. For this reason the PC/AC is equipped with two independent oil filtering system, both under the PLC control. The first one, “on line” system, is made by a set of filters, installed along the main return line with the goal to filter all the oil coming from the machine before being moved again to the hydraulic pumps; they have good filtering capacity able to deal with very high flow although transient. The second one, “off line” system, is made by a set of external filters, with an independent feeding line, with the goal to keep the contamination level as required; they have very high filtering capacity improved by the steadiness of the flow of oil.

Both system are automatically controlled by the PLC and “Filter clogging alarm” is reported to the operator and stops the machine.

All air movements, needed to compensate the oil level variation, are filtered with separate and different systems for inlet and outlet flow.

Cooling and heating system

The heat generated during the working operation of the machine is dissipated by a set of heat exchangers water – oil, thermostatically controlled by the PLC. The fans have special profile to reduce the noise down to 65 dB(A).

The electric power for such devices is independent from the main machine circuit to let them be on with the machine off.

Electric and electronic system

The electric power system, located inside the electric cubicle, is made of magneto thermal switches and differential switches with integrated diagnostic. The control and command electric system PLC input and output boards, interface relays, etc. …, is located in the same electric cubicle and part in the control pulpit cabinet. The electric cubicle with the electronic devices is fully conditioned, in order to have clean environment with the right temperature and humidity for the apparatus.

The handles and buttons to drive the machine are located in the operator’s panel, together with an interactive panel (“touch screen”) with all control functions and the choice between the various working sequences.

The electronic programmable control system allows to set the working sequences as required by the Client's need, with specific "working programs" recallable from the pulpit or the remote control.

The PLC is set to be connected via teleservice © with Vezzani control board, in order to help the operator and the maintenance people on field for a better trouble shooting and process management.

On request the machine can be supplied with a remote control unit, powered by rechargeable batteries or vehicle feeder, enabling the operator to command the main functions from any mobile location, a mobile crane for instance, safely and comfortably.

Lubrication system

A simple and reliable lubrication system is installed in order to ensure the right lubrication for all moving and working parts. This circuit is fed with liquid oil.

The combination of specific artificial friction reducing material, as installed in the guillotine area, and wear resistant steel for other moving parts, such as side ram or clamp, ensures the best lubrication and long lasting operating life for the machine.

The lubrication system is constantly monitored by the PLC and every failure is reported to the operator.

Auxiliary devices

“LCD Screen” Remote control

The machine is be equipped with a remote control system allowing the operator to control and drive the machine from mobile and remote locations. The device, made according the latest European standard, is completely “fail safe” designed and built, as required by the highest safety standards; any loss, overlap or ambiguity in the signal or in case of interference from other sources will stop immediately the machine. Transmission frequency can be modified from the operator in order to avoid any interference with existing radio apparatus and to improve the transmission features. The transmitter (shown in the picture), very light and ergonomic, is powered by a set of rechargeable batteries or by a vehicular feeder. The remote-control unit is particularly suitable in case of operator driving the machine from a mobile vehicle and in case of maintenance activity making possible commanding and controlling specific movements of the machine from the best and safer position.

Remote control frequency is manufactured to Australian Standards: if the signal is lost, the equipment shuts down automatically.

Remote control shows live the cutting force that is used by the machine to increase the sensitivity of the operator

Teleservice ®

The PLC is of latest technology and is set for a modem connection with Vezzani control board in Ovada. On request the connection can be activated allowing Ovada office to dialogue with the PLC with great advantages in terms of quicker and more precise answers and indications in case of trouble shooting or setting of the process parameters.

Monitoring & Reporting Software

Specific software that allows to check equipment performance and efficiendcy and helps in diagnostics. Provides the ability create reports for management purposes.

Self-tensioning device for lower blades

Each through bolt that holds the lower blades is equipped with an hydraulic device that doesn’t allow the blades to loosen and maintains the pressure that has been pre-set on the PLC.

Blades Change Rig:

Unique blade change rig that eliminates handling and heavy lifting and also increases maintenance teams safety & comfort during blade change operations.

Retractable platform for blades replacement

The machine is equipped with a steel platform that is hidden while the machine is operating. The platform can slide and easily extracted when the operator needs to replace the blades.

Device for guillotine removal

A complete set of devices to help in the installing/uninstalling of the guillotine.

“Enerpac” hydraulic device to controlled tightening of the bolts

Winter/Tropical package (where applicable)

The machine is built and equipped with the devices necessary to work in the climatic conditions where it is installed.

PC/AC working mode description

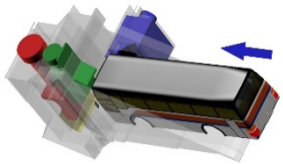
The typical working mode is the automatic uninterrupted repetition of a series of movements, which amplitude and features are pre-set and included in specific “Working program” at operator’s disposal. The choice between the different programs is made according to the kind and nature of the scrap to be processed.

Pre-compression shear mode

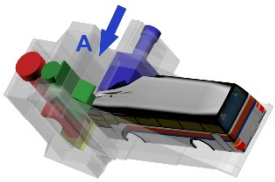
Scrap requiring side pre-compression (tout venant, demolition, vehicles, …)

The side ram is retracted up to a pre-set position, according to the kind of scrap. The clamp is up as well to a pre-set position according to the scrap to be processed.

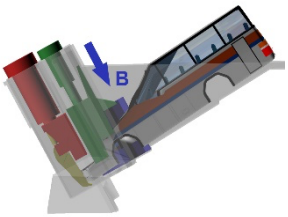
The scrap is free to slide down in the charging box



Side ram moves in, squeezing the scrap up to the cut width (A)

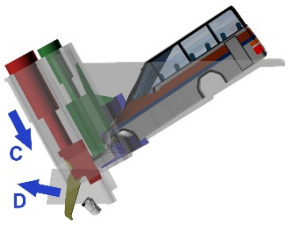


The clamp moves down pressing the scrap up to the pre set pressing force, according to the feature of the scrap (B)



While the scrap is held by the clamp the sizing door opens (D)

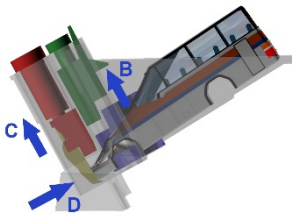
The guillotine moves down and cuts the scrap (C)



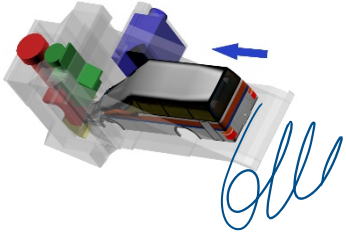
Sizing door moves to the position corresponding to the set cut length and waits the descent of the scrap. (D)

The guillotine moves up to the pre set position, as required by the program (C)

The clamp moves up to the pre set position, as required by the program (B)



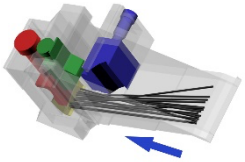
The side ram moves back to the pre set position, as required by the program and the scrap is totally free to move down until it is stopped by the sizing door.



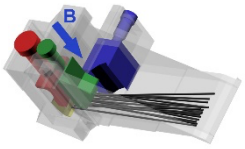
Shear mode

Scrap not requiring side pre-compression (beams, rail tracks, pipes, …)

The clamp moves up to the pre set position, as required by the program and the scrap is totally free to move down until it is stopped by the sizing door.

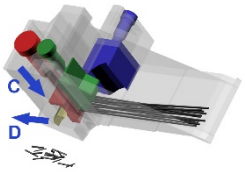


The clamp moves down pressing the scrap up to the pre set pressing force, according to the feature of the scrap (B)



While the scrap is held by the clamp the sizing door opens (D)

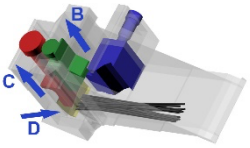
The guillotine moves down and cuts the scrap (C)



Sizing door moves to the position corresponding to the set cut length and waits the descent of the scrap. (D)

The guillotine moves up to the pre set position, as required by the program (C)

The clamp moves up to the pre set position, as required by the program (B) and the scrap is totally free to move down until it is stopped by the sizing door



PC/AC working programs

Automatic "Pre compression Shear" full strokes

The sequence of the movements is repeated automatically and continuously with all the movements covering the full stroke to allow processing voluminous scrap.

Automatic "Pre compression Shear" reduced strokes

The sequence of the movements is repeated automatically and continuously with all the movements covering only the stroke as required by the program selected by the operator according to the dimensions and amount of scrap; cycle time is reduced and productivity is increased.

Automatic "Shear" full strokes

Dealing with long scrap (beams, profiles, pipes, rail tracks, …) the side compression is avoided, with a great reduction in cycle time and so increasing the machine productivity. The sequence of movements, excluding the side ram, is repeated automatically and continuously with guillotine and clamp covering the full stroke to allow dealing with high scrap (typically pipes).

Automatic "Shear" reduced strokes

Dealing with long scrap (beams, profiles, pipes, rail tracks, …) the side compression is avoided, with a great reduction in cycle time and so increasing the machine productivity. The sequence of movements, excluding the side ram is repeated automatically and continuously with guillotine and clamp covering only the stroke as required by the program selected by the operator according to the dimensions and amount of scrap, with a further increasing of productivity.

Manual

All the movements, singularly or combined, can be activated by the operator, from the operator's pulpit or the remote control.

Maintenance

All the movements are available, under manual control, with reduced speed to allow to overcome the end of stroke set by the program and to reach the extreme positions, in opening and in closing.

PC/AC type shear, main advantages

- Reduced over all dimensions of the machine.
- The pre-compression shear is fully automatic and does not require a dedicated operator.
- Scrap of any length can be processed without any previous treatment.
- Voluminous scrap is easier to deal with due to charging box shape and dimension and the particular shape of the clamp.
- The great pressure over the scrap, leading to higher deformation and breaking capability, and the absence of the “bundle up” effect as it happens in horizontal charging box makes the scrap sheared in Vezzani PC/AC shears singularly dense and free so to become a reference standard in scrap industry. In United States and United Kingdom is defined V1 scrap (Vezzani1) the HMS1 scrap processed in Vezzani PC/AC type because the bulk density is higher allowing higher loads for the electric arc furnaces charging baskets, as well as in ships, trucks, and handling devices.
- Less hydraulic cylinders means saving in maintenance, either as direct cost and as down time.
- Smaller surfaces in contact with the scrap mean easier service activities, saving in material and labor cost, saving for reduced down time.
- The lower process and maintenance costs make the PC/AC the scrap processing machine with a total production cost singularly low (in terms of Euro/kg processed scrap), with a return of investment particularly quick and profitable.

Type			*PC 1631 ACLS*
Charging box[1]	width	mm	3100
	Height	mm	3000
	length		Open box allows to process scrap of any length

Pre-compression Group

Side Compression

Max thrust	kN	5500

Vertical Compression

Max thrust	kN	5500
Max height	mm	3000

Shearing Group

Shearing force max	kN	16000
Knives width	mm	1520
Cut width	mm	1270/1390
Cut length		variable: it can be changed from remote control

Installed power	kW	640 + Aux
Electric motor voltage		415 V - 50 Hz
Auxiliary system voltage	V	24 dc

Performances

Cutting capacity[2]

Plate	mm	175 x 1390
Round	mm	275 diameter
Square	mm	247 edge

Productivity[3]

Pre compression shear	full cycle/h	220-280
Shear	cuts/min	up to 5.5 (non stop)

[1] Open box allows any length of scrap to be processed

[2] Steel sample with tensile strength 360 N/mm^2

[3] Productivity varies depending on type of material, loading method and ability of the operator

Pivoting Conveyor

Features of Pivoting conveyor

Held by self supporting framework made of electrically welded heavy thickness steel profiles.

The conveyor band is made of replaceable wear resistant plate sliding on heavy section steel beams.

Both sides of the conveyor channel are lined with replaceable wear resistant plates in order to minimize the friction and material jamming.

Both sides of the conveyor are protected by guard panels easy to remove for maintenance.

The driving head is provided with service platform and relevant staircase.

Driving gears are made from solid steel keyed on a hardened and tempered steel shaft rod supported by self aligning roller bearings set on special construction steel boxes.

Driving groups consisting of orbital hydraulic motor, hydraulic block for the motor with vane pump, tank, distributor, filters, tubes, etc, …; reduction gear with brake mounted on the driving shaft.

The control system check the rotation and the main process parameter, showing them in the main pulpit; any failure is detected, stops the whole plant and warn the operator.

The conveyor can rotate, temporarily, in reverse to free scrap jammed; all commands can be done by the main pulpit and by the remote control. In automatic mode the start up of the pre compression shear follows the start up of the conveyor.

Transmission group consists of steel wheels mounted on hardened and tempered steel shafts supported by self aligning bearings which are set on special construction steel boxes.

The whole group slides on steel saddles placed on the support frame for the tightening and the centering of the band. It is also provided with special springs for compensation of chain elongation.

The band to convey the scrap is heavy type, made from steel wear plates, provided with formed swells and reinforcing ribs.

Independent wheels for the support of the band are set at each two pitches.

The rolling wheels are made in Carbon steel, heat treated, and supported on sealed ball bearings.

At the loading end the band slides on gibs made of wear resistant material, suitable to withstand the impact of the falling material.

Dimensions

Overall length	18.000 mm
Width	1.800 mm

Codes and Standards

The machines included in the scope of supply are designed and manufactured according to European lows in force at contract signature. Any modification due to local standards or rules in force will be negotiated and agreed mutually.

International Quality Standards

- ✓ ISO 9000 certificate issued by TUV

European Standards

- ✓ 2006/42/CE
- ✓ 2014/30/CE
- ✓ En 60204-1: 2018
- ✓ ISO 12100

Applicable Australian Standards

In the Owner's Manual are reported all safety measures required for safety reasons during normal working time, inspection and maintenance.

The customer is responsible of communicating to Vezzani SpA, prior to the development of the machine, the need to comply to quality/safety standards different than those indicated in this paragraph.

Scope of Supply

The supplied includes

- ✓ Pre-compression shear Model & Conveyor as above specified
  - **PC 1631 ACLS**
  - Auxiliary devices as per page 11-12
  - Pivoting conveyor as described
- ✓ Use and Maintenance Manuals with relevant Spare Parts list.
- ✓ Design of dimensional drawings for civil works
- ✓ Design and supply of manufacturing drawings of steel connecting and support elements, covers, protections
- ✓ Supervision to erection, commissioning, start up and training (excluding board & lodging)
- ✓ Packing & transport CIF Port of Melbourne (Australia)

The supply does not include

- ✓ All civil works, protections, and all working area segregation facilities.
- ✓ The feeding cables from the main electric lines to the junction board in the electric cubicles.
- ✓ The hydraulic oil
- ✓ The lubrication oil
- ✓ All support and connecting elements, covers, protections
- ✓ Lifting devices, aerial platform for personnel involved in erection of the machines supplied, all devices needed to carry out the erection and commissioning work.
- ✓ Packing & Transport
- ✓ Board and lodging for our engineers during the erection, commissioning, and start-up of the installations on site.
- ✓ The supply does not include whatever is not expressly specified in the “The supply includes” paragraph.

Standard Vendor List

Component	Supplier
Electric components	Siemens
PLC S7-1500	Siemens
Operator's pannel	Siemens
Electric box and jack boxes	Rittal/Ilme
Sensors and position transducers	MTS/Siemens
Cables and connectors	Pirelli/KME
Electric motors	Siemens
Hydraulic pumps	Rexroth
Cooling pumps	Seim
Distributors	Rexroth
Logic elements	Rexroth
Hydraulic components	Rexroth
Filters	Pall/MP
Motor-pump coupling	MP
Accumulators	Hydac/Olaer
Flex piping	Eco
Brackets	Stauff
Lubrication equipments	Dropsa
Bearing and ball joints	RIV SKF
Cylinders gaskets	Carco/PRP (built under Vezzani specifications)
Wear plates	SSAB Oxelosund AB (Hardox 450-500)
Pipes	Dalmine/Mannesman/Demag