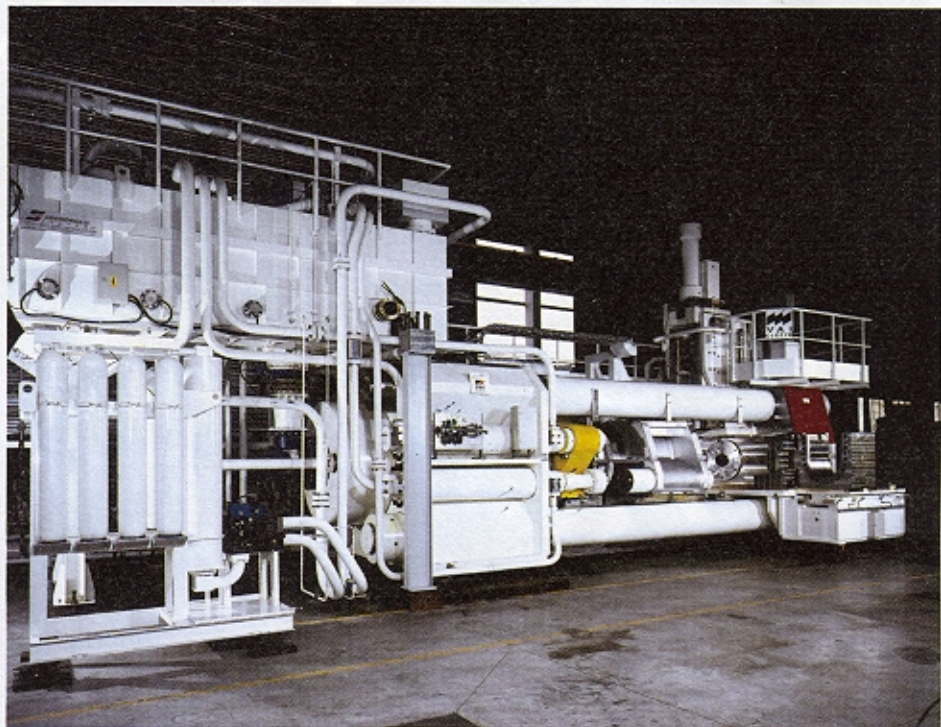


It has taken 25 years for front-loading compact presses to be fully accepted by extruders but now they are the most common type used due to their higher productivity, less maintenance and their ability to clamp multiple billets aligned to the press centreline. VAI Clecim, a member of the VAI Group and inventor of the compact press, presents the results of 25 years of front-loading press developments and innovations.

By Guy Bessey\*

Front loading compact presses are now widely accepted by the extrusion industry



## The front-loading compact extrusion press comes of age

VAI Clecim has been working for nearly 30 years to implement the advantages of compact extrusion presses and promote their merits to extruders. VAI Clecim believes this technology represents a significant breakthrough, which is of benefit to all users in the field of extrusion presses.

This article presents:

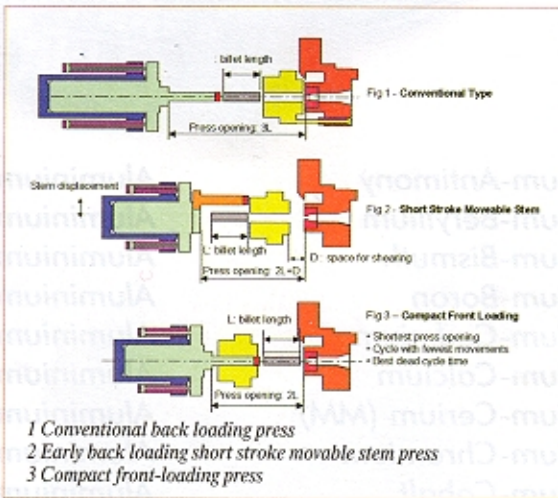
- A brief historical background of this technological route;
- The main advantages of the front-loading compact solution;
- Latest developments proposed;
- Short stroke applied for tube extrusion;
- Conversion of a conventional press to a front loading compact press; and
- Comparison of the different technologies currently used in the market.

### HISTORICAL BACKGROUND

Figs 1 to 3 illustrate the evolution of the Compact Extrusion Press from the conventional press (Fig 1), through the first compact short stroke design (Fig 2) to the even shorter Compact Front Loading press of today (Fig 3).

The history of development started 29 years ago.

● 1975: Commissioning of an 850 tonne back loading short stroke press with moveable stem and billet loading on stem side (Fig 2). The results approached those obtained with conventional presses. How-



ever the concept was abandoned.

● 1980: Supply of the first 2200 tonne compact 'short stroke' front loading press with billet loading between container and die (Fig 3). This first generation press was unable to load two-piece billets, precluding the use of billets with a hot shear.

Considering the results achieved, Clecim decided to stop manufacturing long stroke conventional presses although extruders were reluctant to change in a market, which at the time was very conservative. Clecim started a development programme to find a solution for loading two-piece billets into

the compact front-loading press.

● 1984: Commissioning of the first compact 'front loading' press able to load two-piece billets. For the first time, billets were clamped before loading into the container.

● 1988: Some competitors also begin to build 'short stroke' presses with movable stem and loading on the rear side of the container. This technology first appears as a modernisation concept for conventional presses and later implemented on new presses.

● 1999: Competitors launch their first front-loading press on the market after 19 years of investigation.

VAI Clecim extends the concept to direct and indirect copper and brass extrusion presses.

● 2003: Practically all the presses sold in Europe are now 'short stroke' presses. Most of them are 'front loading'.

● 2004: VAI Clecim manufactures a 'front loading' double effect press applying the short stroke technology to tube extrusion for the first time worldwide (Fig 4).

VAI Clecim built the first prototype front-loading press in 1980. Since then, millions of billets of various material properties have been clamped, loaded in the container and extruded.

Other press manufacturers are at last discovering the advantages of this system ▶

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# EXTRUSION

and speaking highly of the advantages of a solution that has been much debated for 20 years.

## COMPACT PRESS FEATURES

The main benefits that convinced VAI Clecim to persevere with the front-loading compact press are:

- Simple, fast and reliable cycle;
- Reliable billet loading operation;
- Improved extrusion conditions;
- Stiffness of press structure and efficient guiding of movable parts;
- Cost-savings.

## PRESS CYCLE

The 'front loading' cycle contains fewer sequences than a conventional or a movable stem press cycle, hence there is reduced loss of time for acceleration, deceleration and especially switch over of hydraulic valves.

For the same sized hydraulic unit and equal displacement speed, there is a time saving compared with a conventional press or a retractable stem press of approximately 20% (four seconds).

A short dead cycle time is readily obtained under reliable conditions. It is also easy to maintain this in the long term without special maintenance.

The dead cycle time is shorter when using short billets as the press opening length equals the billet length, which is not the case with back loading presses.

## RELIABLE BILLET LOADING

Billets are permanently locked in two telescopic jaws until they are aligned with the press axis and clamped between die and fixed dummy block. Therefore, there is no risk of a short billet falling down or being incorrectly positioned even if its length is shorter than its diameter.

There is practically no limit to the minimum length of the billet, which can be loaded according to the 'front loading' principle.

The billet is clamped in the direction of the press axis and, therefore, never contacts the container liner during loading. Hence there is no friction between container and billet avoiding the billet being jammed when entering the container and also prevents any sticking phenomena eg when pure aluminium billets are used.

There is no relative displacement between the billet and loader when the billet is on the press centreline. The press clamps the billet at the moment when the loader jaws are closed so that a short billet is unlikely to be misaligned.

The billet loader is lightweight, fast and precise. It is actuated through an electric servomotor (CNC) so that the billet is positioned in the press centreline with a precision of a few tenths of a millimetre repeatably and reliably. The loader operates with a high level of reliability: There is no risk that the loader can be crushed by the press or damaged by a 'mushroom'.

Billet clamping on the press centreline is fully automatic. No adjustment is required when billet length, alloys and temperatures are changed. The loader requires only one inspection per year to check that the loading position is on the press centreline.

The loading system perfectly matches the diameter and tolerances of billets and/or logs on the international market. It operates with all types of hot shears produced by European builders.

Two-piece billets can have joint faces sawn (joint between two logs) or sheared, according to the type of billet management used. (Quality defects, which can occur when using two-piece billets are the same whatever the loading principle).

## IMPROVED EXTRUSIONS

Positioning billets on the press centreline before inserting into the container allows symmetrical upsetting of the billet. Thus, the metal does not tend to drive the tools

upward or the fixed dummy block and press stem upwards. Symmetrical upsetting improves uniformity of speed at the beginning of the extrusion process for multi-hole dies (Fig 5).

The clearance between container and billet is only 7mm at the cold billet diameter for sheared billets up to 250mm diameter and 1500mm length or for sawn billets up to 360mm diameter. The Burp cycle is improved and the upsetting stroke limited.

A fixed dummy block is permanently kept inside the container, avoiding thermal and mechanical shocks. The risks encountered on other press types when the fixed dummy block is entered at high speed into the container are eliminated. The container is always closed, which improves temperature stability.

The stem is perfectly maintained in the press centreline. The fixed dummy block and container sealing face on the die are simultaneously lubricated and the operator has a clear view of the loading area as it is not obstructed by the container.

## STIFFNESS OF PRESS AND GUIDING OF MOVABLE PARTS

The main parameters addressed to ensure maximum stiffness of the press are:

- Small distance between columns;
- Short, pre-stressed and large diameter press columns;

- Front and rear platens of heavy thickness;

- All main parts made of forged steel (main cylinder, platen, columns, container holder) (Fig 6).

The quality of the container and main cylinder guiding system on a compact press essentially depends on how the basic rules of mechanical engineering are applied, ie:

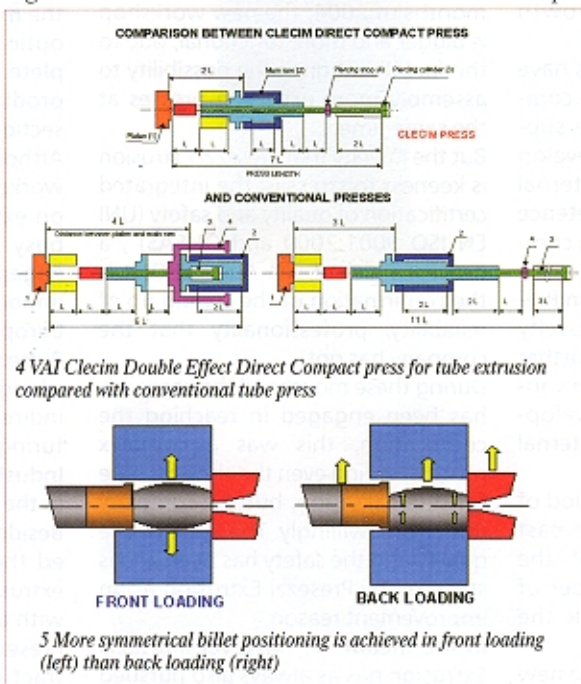
- The length of the guides must be greater than the press width to avoid the 'chest of drawer' phenomenon;

- Adjusting devices must be arranged in the horizontal and vertical planes (Fig 7);

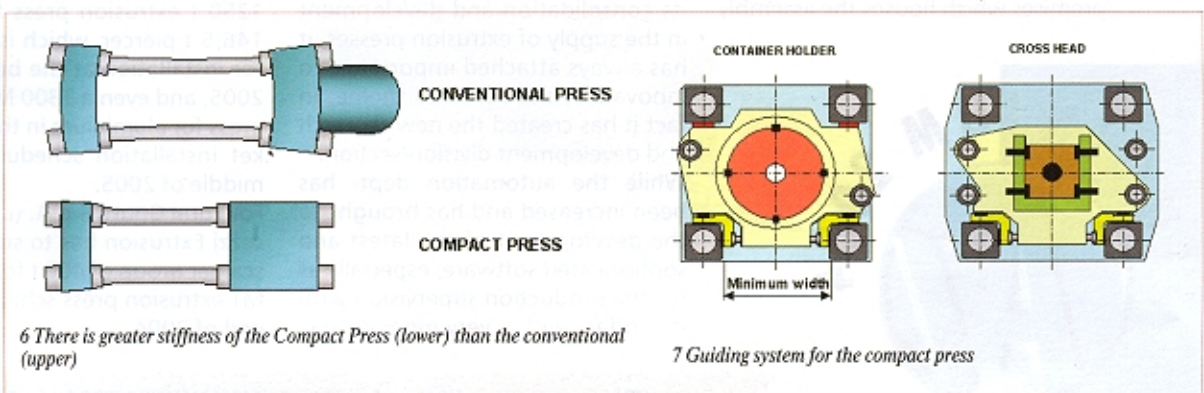
- High stiffness of the press structure is necessary to minimise deformation of the press columns on which the movable parts are guided;

- Eliminate X-shaped guiding systems, which have been a nightmare for former generations, of maintenance engineers;

- After adjustment, the hot press shims must be installed, which will secure the



5 More symmetrical billet positioning is achieved in front loading (left) than back loading (right)



6 There is greater stiffness of the Compact Press (lower) than the conventional (upper)

7 Guiding system for the compact press