COLLIN

Measuring Roll Mills
Automatic Roll Mills

COLLIN-Measuring Roll Mills

Uses

Collin laboratory roll mills are used in the plastics and rubber industries as well as in research establishments for batch an production control, as well as for product and process development work.

Equipment for measuring all the parameters which determine flow inside the nip, as well as new electronic controls for variables enable product properties to be determined quantitatively. Test results are evaluated by means of computers, so that information about the product under test is obtained faster and more easily.

Automatic models ensure smooth operation and protect operating personnel when testing dangerous substances, e.g. explosives or products which produce large amounts of gas.

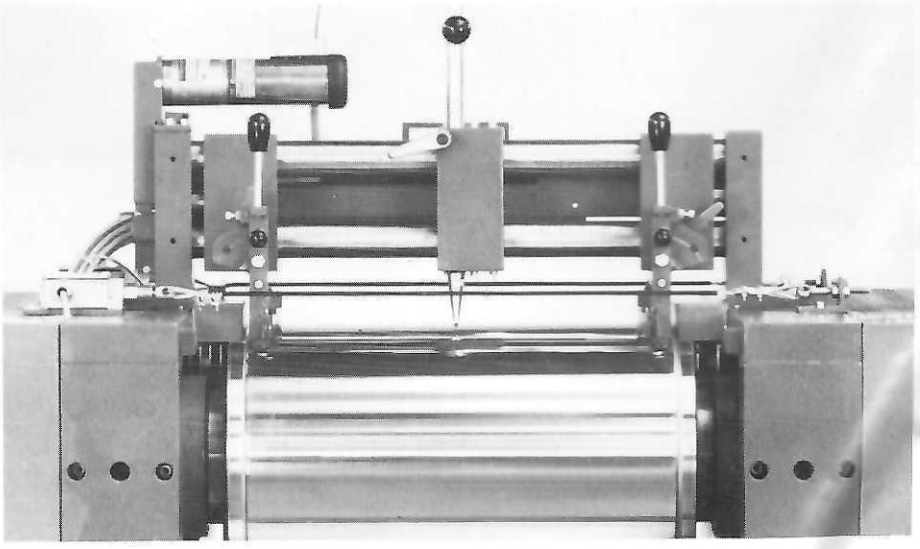
Design features

The machines have been designed so as to combine reliability and simple operation with easy determination of test data, this being achieved as follows:

- More rigid framework enclosing the slide bars
- Slide bars are thermally insulated from the frame so as to facilitate more constant temperature
- Front roll cannot be moved and is supported only against a bearing force gauge. Adjustments are effected by moving the rear roll
- The nip width can be quickly changed hydraulically, fine adjustment being effected mechanically
- Integrated oil heating systems or electrical, three-zone heating for ensuring very constant temperatures
- Each roll is driven separately to enable the torque to be measured accurately
- Compactly constructed, so that the machine needs only a small area for installation
- Quiet-running drive and motors enable the machine to be erected without foundations
- Hinged and axially movable nip guides to make cleaning easier and to vary the batch size
- Electronic controls ensure maximum accuracy and reliability in operation

Safety

- Automatic, hydraulic nip opening, even if the power supply breaks down, with facilities to quickly stop the rolls rotating
- Hydraulic overload prevention device
- Elektrical overload prevention device
- Elektrical, digitally adjustable minimum nip width limiting device



Control and measuring equipment

Peripheral velocity (U)

The roll speed is controlled with the help of a transistor-controlled d.c. motor and measured with a tachometer. The accuracy is ⟨1 % , equivalent to 0,1 — 0,2 m/min.

Roll temperature (Tw)

The roll temperature is controlled to ± 1 K using a circulating oil or, if required, an electrical, three-zone heating system. The temperature is measured by surface probes at the roll periphery, or by sensors let into the roll itself.

Nip width (Ho)

If bearing pressure and torque measurements are to be meaningful, the nip width must be measured accurately and maintained. Nip width is measured immediately next to the roll face, the result being recorded via mechanical scanners and electrical gauges, amplified electronically and displayed digitally in 0.01 mm. The digitally set nip width is controlled to ± 0,01 mm for all operating conditions, using two separate servo-motors.
Electrical, adjustable minimum nip width: if the nip width falls below the required figure, the rolls open immediately and automatically.

Bearing pressure (P)

The bearing pressure is measured with two pressure gauges which are fixed immovably to the frame. The slide bars of the fixed front roll are in direct contact with these gauges. The pressure can be measured accurately because there is no hysteresis when the rolls are being adjusted.

Torque (Md)

Torque is measured simply via the current input of the d.c. motors. Planetary gear losses are relatively small. For exact measurements, electrical pressure gauges, working on the principle of the torque meter, are incorporated in the support points of the suspended drives.

Material temperature (Tm)

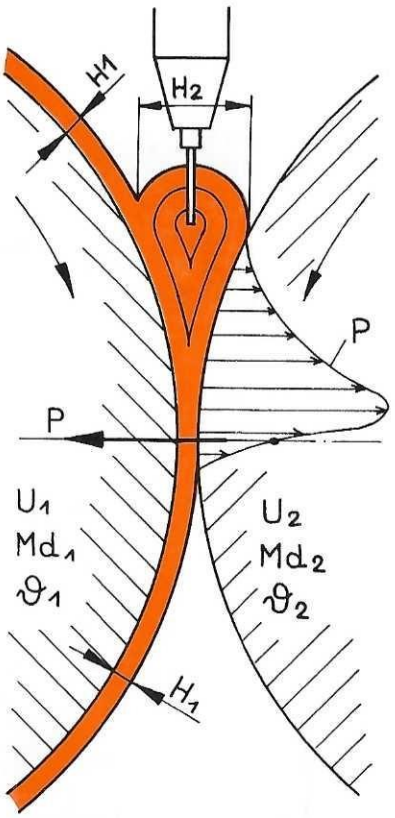
Miniature jacketed thermocouples, held by rigid, insulated supports, are immersed in the bank. In addition, the surface temperature can be measured by means of radiation pyrometers.

Thickness of material on roll (H_1) and bank depth (H_2)

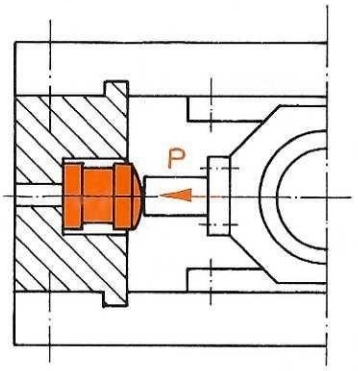
H_1 and H_2 are likewise parameters which determine the bearing pressure and torque and thus also the rheological properties of the material under test. Measurement is by means of sensors and the determination is unaffected by the colour, temperature and type of material.

Adhesive force

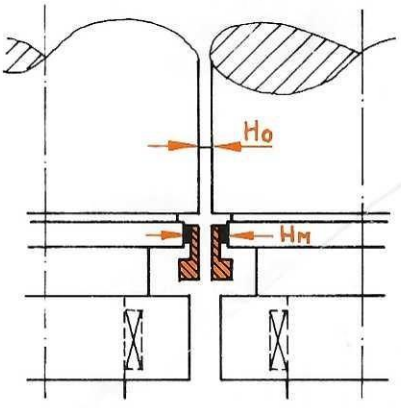
The adhesive force between the compound and the roll is measure of the compound's residence time on the rolls when calendering. It is measured by recording the torque of the reversing roll which is used for automatically mixing the compound. A reproducible value can be determined, related to time, by connecting a recording device.



Material temperature



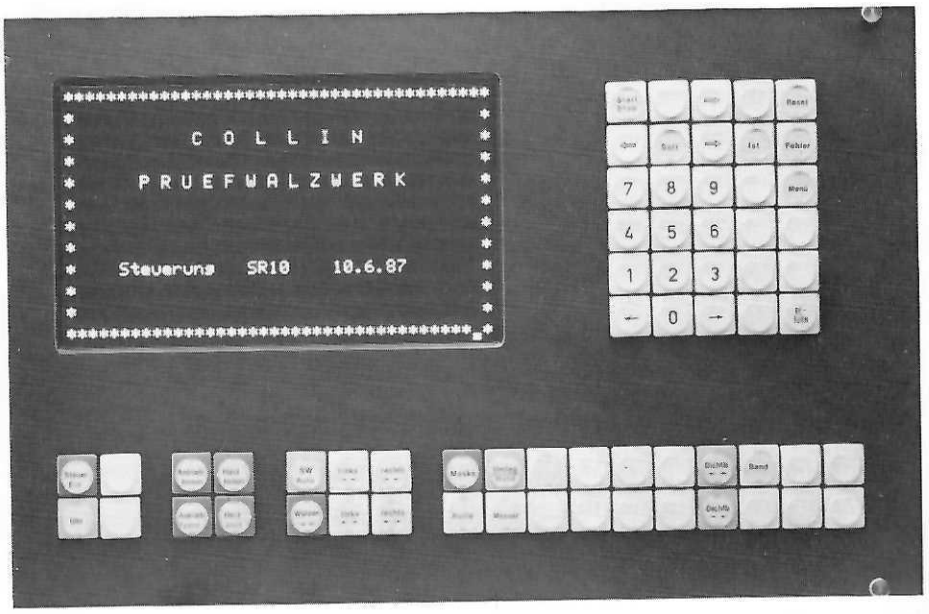
Bearing pressure



Nip width

Programmed operation

All functions during the milling process are controlled by a special programme, which is devided into four sections:
— plasticisation
— testing
— measuring
— removal of compound.
The speed, nip width and time required for each of these can be digitally pre-selected, the appropriate values being determined in a manually controlled preliminary test. All subsequent tests will then follow the same programme with great precision, all errors relating to time, speed and, perticularly, nip width setting, being eliminated.



Controls

The machine is controlled by plug-in cards and a micro-electronic system which has a long life and is easy to maintain.

Evaluation of test results

Displays

Test data can be determined and checked by reading the values an large digital display screens.

Recorders

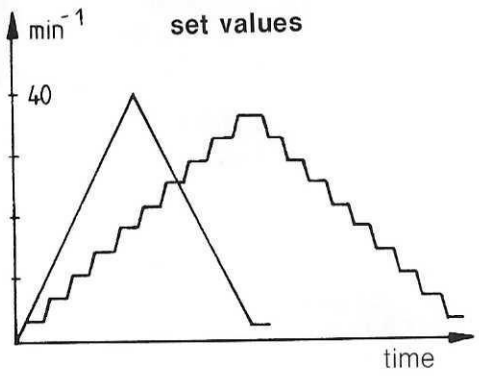
Multi-line recorders as well as XY recorders may be used to determined and record the test data.

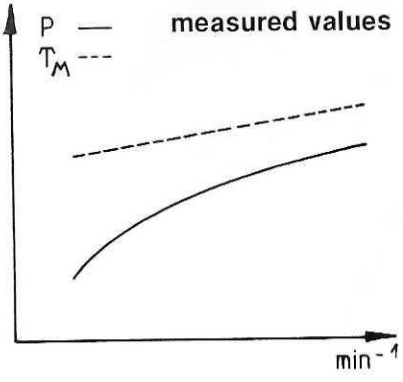
Computers

The use of minicomputers facilitates considerable time saving as well as concentration of information. All the measuring instrument outputs are collected in a data interface. The data are collected from the computer via a special interface, and then stored on tape or diskette. When the test has been completed, the test data can be logged or evaluated further. Print-out of data or curves is archieved by means of printers and plotters. Customers' computers can also be connected if required.

Example

Change of speed at H_0 = const., continously or stepwise, as required.
Result:change of pressure and melt temperature vs. speed.





Automatic Roll Mills

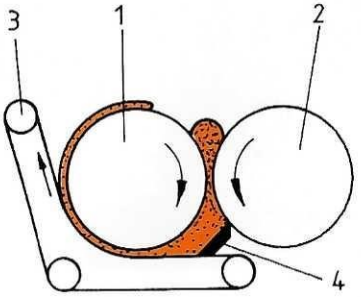
In the case of manual operation there are problems as regards reproducibility and accuracy. These can be eliminated by the following measures:

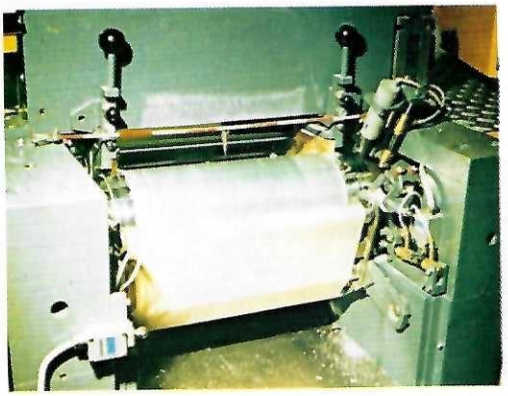
1. Automatic feeding of Material
2. Automatic reversing of sheeted-out material
3. Automatic removal of sheeted-out material
4. Programmed operation

The programme control unit is identical to the one used for the measuring roll mills, described above, with extra outputs for automation.

Feeding the material to the rolls

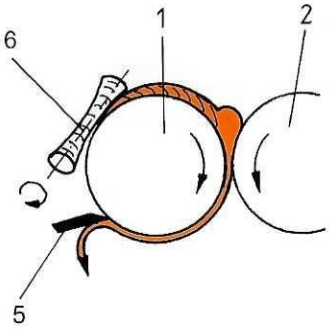
The material to be plasticised is fed to the front roll (1) by means of a conveyor belt (3) which passes underneath the front roll and is lifted up by it. At the same time a stripper device (4) moves towards the rear roll (2) from below, this serving to guide the material on to the belt. In this way, a strip of material is quickly produced on the front roll without any of the material being lost.





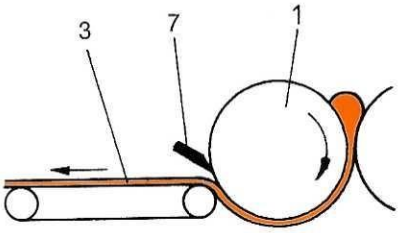
Reversing the strips

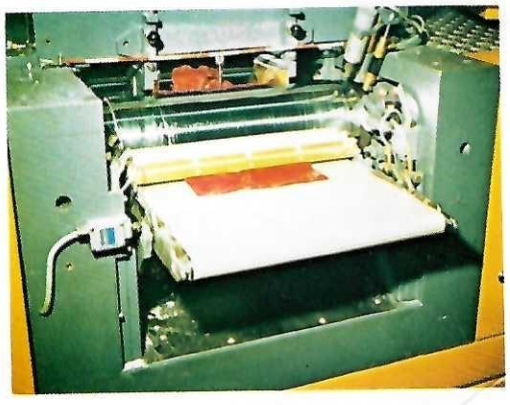
To achieve thorough mixing, the sheeted-out strips of material must be reversed repeatedly. Two reversing units are incorporated on the left and right hand sides in front of the front roll to enable this to be done. One scraper (5) and a powered roll (6) can be moved along the roll surface, either separately or together. Stroke, speed of advance, roll speed and time can be pre-selected as required.



Removal of sheeted-out strips

When the test has been completed, the sheeted-out strips are taken off the rolls by the conveyor belt (3) which was used for feeding the material to the rolls. The belt is raised to the horizontal position and moved close to the front roll (1) near the centre. A knife positioned above the belt (7) cuts into the strip and places the end of the strip on to the belt for smooth removal. .





Advantages

Better reproducibility of machine settings, times as well as the entire process sequence.
More economic operation, since several machines can be operated simultaneously and/or the results of previous tests can be evaluated. Serial tests can be carried out automatically.
Greater safety in case of injury, at high temperatures and in the presence of vapours etc. Completely automatic operation if protection against explosions is required.

Laboratory roll mill, 250 x 450 mm, with programme control and test data recording facilities

Technical data

Roll diameter	mm	150	200	250
Roll face width	mm	350	450	450
Batch weight	g	100-300	100-500	200-800
Drive power	kW	2 x 3,5	2 x 4,5	2 x 8
Speed (stepless)	1/min	0—20/50	0—20/50	0—20/50
Heating capacity	kW	2 x 5	2 x 9	2 x 12
Fine nip adjustment	mm	0,08—3	0,08—3	0,08—3
High speed nip opening	mm	80	80	80
Net weight	approx. kg	1250	1800	2200

We reserve the right to make technical changes!

We also make the following:

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