CLEAN RUBBER

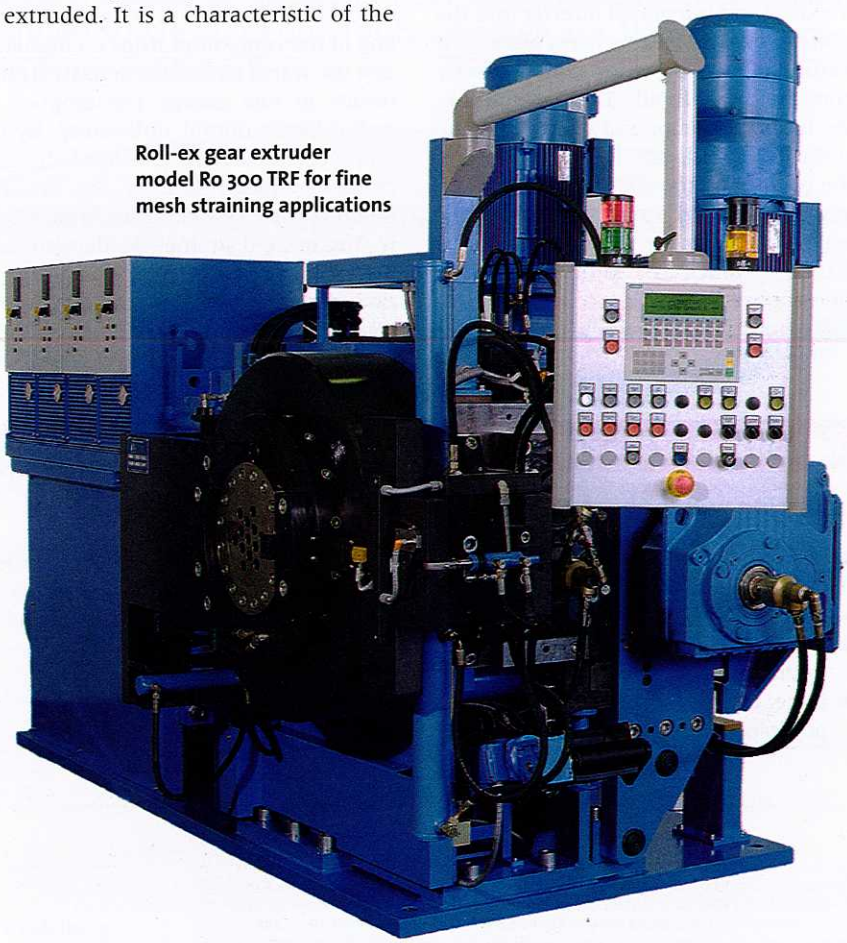
FINE MESH STRAINING WITH GEAR EXTRUDERS **Especially for the straining of rubber compounds developed, the operational capacities of the Roll-ex strainer extruders from Uth ranges from small quantities to several tons per hour. In the following, the system is outlined, established applications are dealt with and effects as well as experiences are reported.**

Product quality requirements have been continually growing for the rubber processing industry during the past few years, while the pressure to contain costs has significantly increased for some elastomer products. Clean rubber compounds that have not been impurified by dirt, foreign substances or dispersed ingredients are the prerequisite for meeting these requirements. On the other hand, efforts are underway to utilize more cost-effective raw materials.

Impurities lead to an increase in the reject and waste rates due to process interferences and to end products that do not feature the required quality properties. This problem can be counteracted by straining the rubber compound. The processing of sensitive and highly accelerated compounds poses new challenges yet for the rubber industry to deal with. In the past there were very often malfunctions during the process and material spoilage when straining with normal screw extruders. This effected in high cost caused by the material waste and the interruption of the process. Frequently, these were the reasons due to not straining the material. Because of economical reasons, productivity improvement and process optimization are also required.

The straining of highly accelerated rubber compound with fine mesh screens, also referred to as fine straining, has proved to be an effective step to avoid waste rates due to impurities within the compound or not dispersed raw material. The impurities are separated by straining under high pressure. On the basis of their operating principle, the Roll-ex strainer extruders from Uth, Fulda, are able to generate high discharge pressures with constant low working temperatures. The gear extruders work on the principle of the gear pump, i.e. they function as positive displacement pumps. This mode of operation results in the basic features of the gear extruder: constant compound temperature, independent of the counter pressure; volumetric transport, nearly independent of counter pressure; high attainable discharge pressures, and gentle material handling by comparably low material temperatures.

The goal of this machine technique is the optimum adaptability to the material to be extruded. It is a characteristic of the system that all forms of material used in rubber productions and the respective processing steps like strips, slabs, granulates, as well as charges/batches can be processed. Especially high viscose and hard rubber compounds can be sufficiently pre-plasticised. The feeding can be conducted with cold or warm material. The modular constructed extrusion system permits the combining of different feeding devices, as well as different extrusion heads with the process part of the gear pump, corresponding to the respective application of the gear extruder as a system.



Roll-ex gear extruder model Ro 300 TRF for fine mesh straining applications

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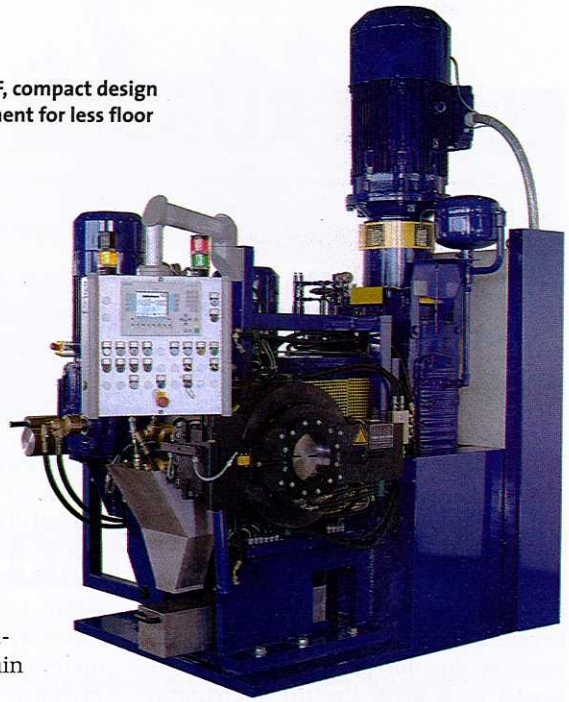
Avoiding waste

Product quality requirements have been continually growing for the rubber processing industry. Clean rubber compounds free of impurities as dirt, foreign substances or not dispersed ingredients are the prerequisite for meeting these requirements. The straining of highly accelerated rubber compound with fine mesh screens has proved to be an effective step to avoid waste rates due to impurities.



Gear extruder model 150 TRF, compact design with vertical drive arrangement for less floor space (Photos: Uth)

Tree ways to clean rubber

There are three ways in staining rubber compounds. Each of them has its own advantages:

Straining within the straining cell – The straining cell consists of the compound provision, the gear extruder and the strip or slab cooling device (batch-off) including compound depot. The rubber compound to be strained is fed as strips, slab or granulate in a cold condition. At the exit of the strainer head the filtered material can exit as strips as well as slab or granulate. During changing of the screen, the entire facility comes to a stop including the cooling operation since a continuous operation is not required.

Straining within the mixing line – The gear extruder is integrated directly into the mixing line. The feeding takes place with warm material as strips come directly from the two roll mill. The two-roll-feeder, feeds the compound strips according to the mill speed, into the gear extruder. The compound transport is supported by conveyor belts in front and behind the gear extruder. After straining the compound is formed as slab or strips and is then cooled. The twin-screw (DSE) version of the extrusion system has been developed for applications where the process allows working without a two-roll mill. It is placed therefore next to the internal mixer. At this solution the gear extruder is fed by a conical twin-screw. The material dropped from the internal mixer is falling straight into the twin-screw extruder, which supplies it continuously to the gear extruder. The crossover from batch process into continuous process is taking place within the machine.

Straining within the extrusion line – Hereby the straining is conducted just prior to the extrusion of the final product. The gear extruder is cold fed with strips or granulate. The strained compound directly feeds the screw extruder with warm compound. Aside from the quality improvement of the compound, also significant energy savings are a result. Cooling of the compound strips is eliminated and the warm feed of the screw extruder results in low energy consumption as well a better output uniformity. By the arrangement of a loop control the gear extruder always follows the requirements of the screw extruder automatically. The utilized strainer heads with large screen areas permit long operating periods depending on contamination of the compound.

Prospects

From today's perspective it is obvious that gear extruder technology for the rubber processing industry has a positive influence on the process optimization and increase in quality. The production of some innovative products was possible only in connection with this material friendly technology.

A further goal will be the increased conversion of the individual application possibilities in this market segment. The production costs can be lowered, which will make products from rubber material even more competitive. In today`s rubber industry a demand of machines with a considerable increased operational capacity is perceptible. ■

Advantages of the different ways in staining rubber compounds

Straining within the straining cell	Straining within the mixing line	Straining within the extrusion line
■ The straining occurs independently of mixing operation and extrusion operation, ■ The machine can be quickly adjusted to changes in mixing, ■ Larger capacity of the installation is possible.	■ Economic solution and material gentle since the compound is strained in a warm state and a cooling process and plasticising procedure is eliminated, ■ The warm feed also allows for the straining of compounds of high viscosity and density	■ Economic solution since the compound is fed warm directly, thereby eliminating a cooling process and a melting process, ■ The strainer operation can be observed by the personnel of the extrusion line and therefore does not require an individual operator, ■ The continuous and warm feeding of the screw extruder with the optimum strip geometry increases the precision of the final profile.