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INTRODUCTION

YOUR NEEDS - OUR MISSION

In the rubber and tire industry yesterday's technology is being replaced by today's innovation for tomorrow's requirements. Amidst the turmoil of innovation there is, however, one constant:

VMI's commitment to supply innovative and reliable services and equipment to the rubber and tire industry.

YOUR NEEDS - OUR CHALLENGE

VMI supplies millroom equipment and a complete line of tire manufacturing, tire curing and tire testing systems for bias and radial tires for cars, truck, utility and off-the road vehicles. Our services range from financing to engineering and contracting projects. We also offer maintenance contracts and upgrade existing rubber and tire equipment. We work closely with clients to create customized solutions that meet their needs.

Rightfully, VMI is known as the leader in millroom equipment and single-stage tire building machines for radial car and truck tires.

YOUR NEEDS - OUR NETWORK

VMI's network of agents is constantly monitoring local market developments on all continents. Our R&D department collaborates with the leading international rubber research institutes and with key suppliers of commercial components. Our vast expertise and experience in rubber and tire production engineering enables us to respond rapidly to market developments and to specific needs of our clients.

For cost-effective systems that are tailored to your requirements, VMI is the company to work with

YOUR NEEDS - OUR SERVICE

VMI's global organization includes spareparts supply and servicing from our plants in the Netherlands, USA and P.R. of China. Our service departments are on call 24 hours a day to provide rapid on-site service.

VMI: a partner to rely on in the race against time - and your competitors!

MILLROOM EQUIPMENT



MIXER FEEDER

For automatic feeding of master batch compound to the inner mixer

- · Extremely heavy-duty design
- Double "huggerbelt" inlet conveyor, smoothing out folds in rubber slabs
- Designed for cutting rubber slabs of up to 1.200 mm width into single strips
- · Continuous cutting of slabs up to 24 mm thick
- · Simultaneous slab feeding from two or three pallets.

MILLROOM EQUIPMENT



CANTILEVER BATCH-OFF

For automatic anti-tack dipping, cooling, drying and stacking of rubber strips and slabs

- For strips and slabs up to 450 mm width
- · High cooling capacity per square meter
- Dip tank module, entirely executed in stainless steel
- Electric driven cooling rack with between
 6 and 40 cooling fans
- Wide variety of stacking equipment available for slabs, strips and sheets
- · Sophisticated control system
- · High reliability and easy maintenance

MILLROOM EQUIPMENT



HIGH PERFORMANCE BATCH-OFF

For automatic anti-tack dipping, cooling, drying and stacking of rubber strips and slabs

- Suitable for installation behind an open mill or Roller-Die extruder
- For strips and slabs up to 900 mm or optionally even up to 1.200 mm width
- Capacity of up to ten tons of rubber compound per hour
- Frequency controlled electrically directdriven cooling rack chains for accurate positioning
- With patented MHD III stacker, capable of very precise stacking at high-speed
- Stacking on flat pallets as well as inside boxes
- Wide variety of special options like hot samplers, metal detectors and automatic pallet handling

BEAD APEX ASSEMBLY



PASSENGER BEAD APEX MACHINE

VMI's full-automatic Passenger Bead Apex Machine assembles the apex on a tire bead in one continuous and integrated operation to consistently produce uniform assemblies with highly accurate apex splices. The assembly system is quickly and easily adjusted to accommodate specific bead diameters in the range from 12" – 24", with the apex extruded in line.

- Bead sizes range from 12" 18", 14" 20" and from 16" – 24"
- Apex height from 8 70 mm
- Change-over time < 15 minutes
- Maximum throughput 10,000 beads per day

EXTRUSION, STRAINING AND PREFORMING

VMI-AZ Extrusion GmbH has developed a wide range of extrusion systems for the technical rubber industry. Their portfolio includes: Combex continuous preformer, Vacuum extrusion for salt bath, microwave and hot air lines, Extrusion heads, Planetruder single drive system and Shark cold feed strainer.

COMBEX CONTINUOUS PREFORMER

The basic aim for the development of the VMI-AZ Combex system was to design a machine for continuous production of rubber preforms to be used in vulcanization presses. For the production of rubber preforms the rubber needs to be homogeneously plasticized, extruded with constant output and cut into the required length i.e. weight.

All these three process steps can be continuously performed by a VMI-AZ Combex - Preformer. This is achieved by combining a single screw rubber extruder with a volumetric operating gear pump and a knife. The VMI-AZ Combex system comes in three sizes, i.e.:

Combex 45, 60 and 90.



PLANETRUDER SINGLE DRIVE SYSTEM

The Planetruder® with single drive is used as side feed extruder in continuous mixing applications such as for production of thermoplastic elastomers (TPE / TPV) or continuous rubber mixing. For such applications the Planetruder is connected to the compounding extruder and feeds continuously with an extremely high precision rubber to the compounding extruder. In most applications the used compounding extruder is a co-rotating twin screw as it is well known from plastic industry. There are three single drive Planetruder® versions, i.e.:

Planetruder® S, M and L.



SHARK COLD FEED STRAINER: EXTRUDER GEAR PUMP SYSTEMS (SHARK®)

Shark® Systems, mainly for applications of cold feed straining and vacuum extrusion in the technical rubber industry, consist of a single screw extruder in conjunction with a two rotor gear pump. Depending on the application, the single screw extruder can be a pin type, transfermix or transfermix vacuum extruder. Contrary to Combex systems the Shark® features increased drive power to handle all kinds of cold feed applications.



EXTRUSION

VMI-AZ Extrusion GmbH has developed a wide range of extrusion systems for the technical rubber industry. Their portfolio includes: Pin-Type extruders, Transfermix extruders (MCTD), Extruder gear pump systems, Multiplex extrusion systems, Extrusion heads, Planetruder

PIN-TYPE EXTRUDERS

Pin-Barrel extruders are designed to generate additional shear flow in the extruder screw channel for achievement of a homogeneous temperature heat-up of the rubber and plasticization. Due to the pins the rubber flow is divided when passing a pin and re-united. If higher energy input is required for the extruded compound the maximum number of pins can be successively increased to a total of 36 pins. Therefore Pin-Barrel Extruders offer a high flexibility for optimization of the cold feed extrusion process for each individual compound.



and quadruplex extruders.



STEEL BODY PLY CUTTER/SPLICER

The full-automatic steel body ply cutter/splicer system processes calendered steel cord to produce steel body ply for all-steel radial truck and bus tires. The cutting knife at a fixed cutting angle of 90° gives a high quality cut every time, even straight after knife change and adjustment. Exceptional splicing strength and accuracy is archived because splicing pressure is applied from both top and bottom of the material. Many options are available to customize the steel body ply cutter/splicer.

- · Cutting and splice angle 90°
- · Effective cutting length 1.600 mm
- · Feeding and splice length up to 1.200 mm



TEXTILE CUTTER/SPLICER FOR RADIAL CAR TIRES

The full-automatic 90° textile cutting/splicing system produce highly accurate textile body ply with next-to-butt splices for passenger radial tires. The fully automated dustless disc & bar cutter at cutting angle of 90° gives a high quality cut every time. In one continuous operation, the leading edge of the cut material is spliced at right-angles to the trailing edge of the previous cut with an accurate overlap. This overlap can be set at choice between 1 – 3 mm and gives a close-to-butt splice.

- Cutting and splice angle 90°, optional 85° 95°
- · Effective cutting length 1.600 mm
- Feeding and splice length 300 1.000 mm



BALDWIN FAMILY

For the manufacture of reinforced components for radial tire manufacturing

The Baldwin range of machines eliminates the need for a calander by extruding reinforced strip to produce body ply and breakers (belts) for radial passenger, truck and OTR tires. All of the machines utilize the latest advances in gear pump extrusion and vision systems to produce dimensionally stable strip which together with advanced servo positioning systems results in unsurpassed quality of the final component.

The range of machines includes:

- Baldwin 2 x 30 350: Integrated with VMI MTM cell for manufacture of passenger breakers material in-line
- Baldwin 80 800: For the production of passenger body ply directly onto the carcass building drum
- Baldwin C150 4000: For Production of radial OTR Body ply & Breakers
- Baldwin 180 600: For Production of Passenger & Truck Breakers
- Baldwin 10 x 10: For Production of Capstrip material



TWINS CUTTER/SPLICER SYSTEM FOR BREAKER MATERIAL

The full-automatic TWINS cutter/splicer system processes calendered steel cord to produce breaker material for radial passenger and truck tires. The TWINS cutter/splicer is fitted either with a disc & bar or guillotine cutting system. Both give an excellent cut and are specifically designed for extended life of the knife blade. The automatic splice is highly accurate, because the cut breaker strips are fully controlled throughout the splicing process. Many options are available to customize the TWINS cutter/splicer system.

- Cutting and splice angle from 15° up to 70°
- · Feeding and splice length up to 2.000 mm
- · Effective cutting length 4.200 mm



VMI 242-SL PASSENGER TIRE BUILDING

The VMI 242-SL is a single stage tire building machine for radial passenger tires. Bead sizes range from 12" to 20". Maximum green tire diameter 820 mm. The "low investment alternative".

- · Excellent green tire uniformity
- · Manual breaker servicer
- · High productivity with two operators
- High flexibility for small batch sizes
- · Quick-change material cartridge systems
- Carcass building drums; mechanical or bladder turn-up
- · Tooling interchangeable with VMI 248-SL
- · Fully upgradeable
- · Makes optimal use of low-wage situations
- · Excellent price/quality ratio
- · Modular system with numerous options

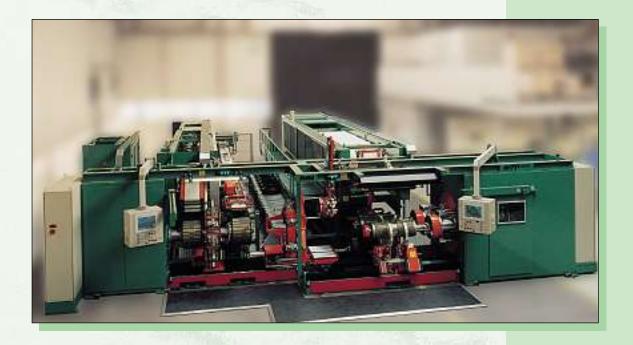


VMI 248-SL PASSENGER TIRE BUILDING

The VMI 248-SL is a single stage tire building machine for radial passenger tires. A troublefree and reliable operation for decades is achieved by selecting only the highest quality components and assembling by skilled craftsmen.

Available in bead sizes from 12" to 20". Maximum green tire diameter 820 mm.

- · Excellent green tire uniformity
- · High productivity, up to 1400 tires per day
- · High flexibility, for small batch sizes
- · Quick size and material changes
- Customized solutions numerous possible features
- Carcass builing drums; mechanical or bladder turn-up



VMI 2020 SYSTEMS

The VMI 2020-S is a single stage, 4 drum, tire building machine for radial passenger tires. Bead sizes range from 12" to 19". Maximum green tire diameter is 760 mm.

- · Excellent green tire uniformity
- High productivity, up to 2000 green tires per day
- Quick size change tooling
- · Operator friendly machine design
- · Automatic green tire removal system
- · Quick-change material cartridge systems
- Carcass building drums; mechanical or bladder turn-up
- · Modular system with numerous options



VMI 348-S PASSENGER TIRE BUILDING

The VMI 348-S is a single stage tire building machine for a wide range of radial passenger tires from Ultra High performance to SUV tires and even for smaller standard tires. It is designed for bead sizes from 14" to 24". Maximum green tire diameter 1000 mm.

- · Excellent green tire uniformity
- Very accurate material cutting, measurement and application
- · High flexibility, for small lot sizes
- · Size changes can be made very quickly
- · Green tire removal system
- · Quick-change material cartridge systems
- Carcass building drums; mechanical or bladder turn-up
- · Modular system with numerous options



VAST QUATTRO 4 HP

The VMI VAST QUATTRO 4 HP, all-steel radial truck and bus tire assembly system is a four drums tire building machine, based on VMI's latest technology in component handling, length measuring, cutting positioning, and drum application. This assembly machines only requires two operators..

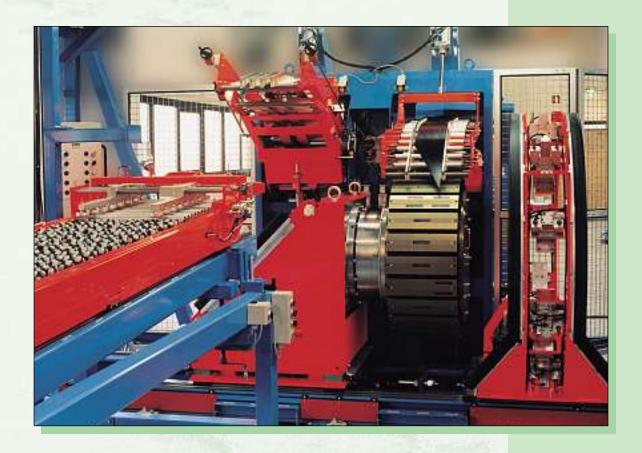
- Bead sizes range from 17.5"- 24.5"
- Mechanical (no bladders) drums for shaping, carcass and belt & tread package building
- Multi size shaping drum
- · Conical and mechanical bead lock system
- Daily output 450 tires, depending on tire construction
- · Modular design and user-friendly MMI



VAST QUATTRO 3 HP

The VMI VAST QUATTRO 3 HP, all-steel radial truck and bus tire assembly system is identical to the VAST QUATTRO 4 HP, however, it has three drums, and uses VMI's latest technology in component handling, length measuring, cutting positioning, and drum application. This assembly machines only requires two operators..

- Bead sizes range from 17.5"- 24.5"
- Mechanical (no bladders) drums for shaping, carcass and belt & tread package building
- · Multi size shaping drum
- · Conical and mechanical bead lock system
- Daily output 350 tires, depending on the tire construction
- · Modular design and user-friendly MMI



VAST QUATTRO 3 SA HP

The VMI VAST QUATTRO 3 SA HP (Semi-Automatic 3-drum High Performance), all-steel radial truck and bus tire assembly system is identical to the VAST QUATTRO 3 HP, but, with less automation. Important sub-systems that influence tire quality, such as the tire building drums and transfer systems, are identical to the design used in the VAST Quattro 4 HP and VAST Quattro 3 HP. The servicers for the carcass package and the breaker & tread package building are however different and require more manual involvement of the operator.

- Bead sizes range from 17.5"- 24.5"
- Mechanical (no bladders) drums for shaping, carcass and belt & tread package building
- · Multi size shaping drum
- · Conical and mechanical bead lock system
- Daily output 350 tires, depending on tire construction
- · Modular design and user-friendly MMI
- · Makes optimal use of low-wage situations



VMI OTR TIRE BUILDING SYSTEM

Designed to produce green radial OTR tires in the bead range 25"- 35" in one process, utilizing flat drum building technology with transfer rings. This unique method of producing radial OTR tires makes use of proven technology from All Steel Truck tire assembly resulting in repeatable, high quality radial tires combined with a high machine output with a minimum amount of tooling.

A typical output of up to 2.5 tires per hour can be achieved depending on machine configuration, degree of automation, number of tire components, tire design and type of compound used. Size change down time has been reduced to a minimum due to maximum use of universal computer controlled units.

- One process or single stage building method creates unmatched building accuracy, no in between logistics, no sagging and deformation of carcasses due to intermediate storage, less floor space requirement, reduced number of operators and high productivity.
- Depending on customer requirement, the machine can be configured for flat- or high crown type drums each with their specific advantages.
- Due to optimised geometry of the turn-up mechanism of the revolutionary mechanical shaping drum, turn-up forces can be much higher. Improved consolidation of bead area and troublefree turn-up of heavy constructions

TIRE CURING EQUIPMENT



52" * TYPE H200T VMI HYDRAULIC TIRE CURING PRESS

For the curing of tires up to an outer diameter of 39" or 990 mm (green tire), with an automatic loading and unloading system. The H200T maintains precision alignment, minimizes tire distortion and provides even distribution of temperature and forces, both internally and externally, to the tire.

- Two independently operating cavities, each with own loading and unloading system
- Very compact footprint, installable on floor level
- Bolted together design, using viewer parts.
 Ship readily containerized and start-up is quick

- Low maintenance, leak free press components and application of leak prevention techniques. Yet still very accessible design
- Infinite life design with low stress and minimal bending
- · No welds or castings in squeezing assembly
- · Automatic mold height adjustment
- · No floating bolsters
- · Fast cycle time

^{*} maximum mold diameter (inside shields)

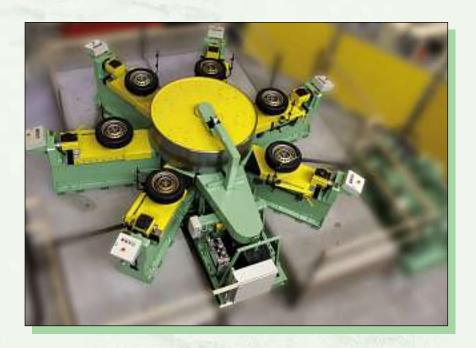


2-POSITION TIRE TEST MACHINE FOR PASSENGER AND TRUCK TIRES WITH VERTICAL ROAD WHEEL*

Specifically designed to test two tires simultaneously. Tests in compliance with DOT, SAE, ECE and other international standards.

- · Robust design
- Load is applied to each of the positions independently by means of a hydraulic system
- Very low friction linear guides which ensures high accuracy and repeatability
- State-of-the-art electronics are used for positioning, measuring and controlling
- Includes a user-friendly menu-driven control system
- Options as tire pressure and regulation, ambient temperature measurement, tire contained air temperature measurement,

- tread temperature measurement, camber adjustment, slip adjustment, tire deflection measurement, footprinting, calibration kit, separate operator console
- Special options: high angle in center slip adjustment or in center camber adjustment, eventually during test run
- · High-speed version available
- * Also enlarged version available for agricultural and earth moving tires, 2250 mm tire diameter, load up to 400 kN



6-POSITION TIRE TEST MACHINE FOR PASSENGER TIRES WITH HORIZONTAL ROAD WHEEL*

Specifically designed to test up to 6 tires simultaneously. Tests in compliance with DOT, SAE, ECE and other international standards.

- Robust design
- Load is applied to each of the positions independently by means of a hydraulic system
- Very low friction linear guides ensure high precision and repeatability
- State-of-the-art electronics are used for positioning, measuring and controlling
- Includes a user-friendly menu–driven control system
- Options include tire pressure and regulation, ambient temperature measurement, tire contained air temperature measurement, tread temperature measurement, camber adjustment, slip adjustment, tire deflection measurement, footprinting, calibration kit, separate operator console

^{*} Also 4-position version available

FORCE & MOMENT TIRE TEST MACHINE

Specifically designed for advanced force and moment testing of passenger or truck tires. Tests in compliance to OE requirements.

The VMI F&M test machine is designed to do all kind of tire tests to measure the dynamic behavior of a tire under different slip and camber angels in a high dynamic way. A version with driven tire hub is also available, a so called TREAD WEAR tester.

- · High dynamic slip and camber adjustment
- · 6 Component measurement hub, Fx, Fy, Fz, Mx, My, Mz
- · Test speed up to 420 km/h
- · Passenger version loads up to 25 kN
- · Truck version loads up to 100 kN
- · Robust, modular design
- · High speed data collection and evaluation
- · User-friendly programming of test procedure
- · Menu structure can be customized
- · Various options available



TEST MACHINES

INDOOR TIRE TREAD WEAR TESTING MACHINE

Specifically designed for Tire Tread Wear simulations of passenger tires. As tests can be performed in a laboratory environment tire tread wear can be determined faster and with a better repeatability than with conventional road tests.

Wheel load, acceleration and deceleration as well as tire movements can be simulated to reproduce the forces and moments a tire experiences on the road.

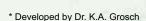
- · High dynamic slip and camber adjustment
- · Driven and braked tire spindle
- · 2 Component measuring hub; Fz, Fy
- · Lateral force control using the slip angle motion
- · Passenger version load up to 25kN
- · Test speed up to 250 km/h
- · Fully hydraulic system
- · Removable sector plates to quickly change surface texture
- · Talcum powder supply and removal system
- · High speed data collection and evaluation



LAT 100 - LABORATORY ABRASION AND SKID TESTER

Enables the determination and comparison of skid-, traction- and wear resistance characteristics of a tread compound sample according to predetermined test programs and methods*, for various road conditions.

- Fast and economical test procedure that reduces or occasionally eliminates the need for extensive real road tests
- A sample in the form of a small solid wheel is pushed on a rotating disc. Speed, surface of the disc, slip angle and load can be varied
- Disc smearing is avoided by applying magnesium-oxide powder to the disc. Dry circumstances can be simulated, by applying water to the disc
- Optional special disc versions are available for temperature controlled simulation of icy and hot conditions,
- Special LAT-Explorer software installed on an industrial PC with screen enables quick overview, comparison and storage of test data
- Space requirements are limited and the machine is completely encapsulated

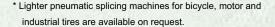




TIRE INNER TUBE SPLICING MACHINES

HYDRAULIC TIRE INNER TUBE SPLICING MACHINE FOR PASSENGER, TRUCK, AGRICULTURAL AND EARTH MOVER TIRES

- · Flexible design. Wide range of dimensions per machine possible
- · Auxiliary valve application possible
- Various types available





AIR-SPRING BUILDING SYSTEMS



VMI AIR-SPRING BUILDING SYSTEMS

VMI offers an extensive range of Air-spring Building Machines suitable for the production of several types of air-springs and with a flexible level of automation. Single stage or one process systems are available for the assembly of cylindrical types in one step; two stage systems can be used to build conical or air-springs with different bead sizes in two steps.

The mechanical turn-up technology and accurate component preparation are based on the same principles as used in VMI's well known and proven tire building systems.

Available types of Air-spring Building Systems:

• ASBM-SF: Single stage/flat building: complete air-spring (cylindrical)

ASBM-1V: First stage: sleeve

ASBM-2PP Second stage/high crown: beads and turn-up (cylindrical)
 ASBM-2E: Second stage/conical drum: both beads and turn-up (conical)

• ASBM-1P: First stage/high crown: sleeve with small bead

ASBM-2E: Second stage/conical drum: big bead and turn-up (conical)

RUBBER TO METAL PROCESSING

VMI-MTI

VMI-MTI has developed Modular Platforms for Adhesive Coating Application Systems for the production of rubber to metal bonded parts, Injection Molding Systems based on the method of unmatched part-to-part consistent production and Downstream Equipment for the assembly and/or final processing of finished parts.

VMI-MTI incorporates the required automation into their systems. The development and integration of automation and robotics is done in our own house providing turnkey concepts meeting customers' demands and budgets.

Adhesive Coating Application Systems

VMI-MTI can provide various levels of automation to meet specific customer requirements. Our Adhesive Coating Application Systems can be executed with visual inspection to monitor successful coating application.

These machines provide:

- · High output
- · Efficient use of primer and coating
- · High level of automation
- · Low footprint
- · Low energy consumption
- · Primer and adhesive application in one cycle
- · 100% capture of solvent



RUBBER TO METAL PROCESSING

INJECTION MOLDING SYSTEMS

VMI-MTI Injection Molding Systems are recognized by their reduced material usage, fleshless production and scrap reduction. VMI-MTI Injection Molding Systems provide:

- Single Cavity Molds leads to high reproducibility and minimum drop-outs
- · Fleshless Production eliminates costly secondary operations
- Less Scrap (sprues being 5% of shot size)
- Curing Rates that are historically half of what is required by our competitors
- Optional Integrated Automation, robotized loading and unloading of parts
- · Turnkey Concepts



DOWNSTREAM EQUIPMENT

Our skills in this area have been developed over years of providing automation to our line of VMI-MTI Injection Molding Systems. We have a firm grasp on material handling, pneumatic pick and place devices, robotics, hydraulic crimping and swaging. Basic available Assembly Platforms provide:

- Pallet Based or Indexing Rotary Table Systems with specific Tooling Plates
- · Pick and Place Devices and Robotics
- · Hydraulic Crimping or Swaging
- · Product Date Code and ID Marking
- Integrated Quality Checks like Color coding,
 Vision and Physical Dimension Checking



MACHINERY FOR CAN INDUSTRY



WASHING MACHINES AND DRY-OFF OVENS FOR TWO-PIECE BEVERAGE CANS (Aluminum or Steel)

Standard Features

- Self tensioning hold down in high spray pressure stages
- · Blow off between stages
- · Synchronized direct driven belts
- · Magnetic or vacuum transfers
- PLC controlled
- · Horizontal spray pumps
- · Lightweight spray pipes
- · Quickly disconnects for headers and risers
- · Highly effective spray pattern
- · State of the Art graphical user interface
- · Remote I/O system

Technical Data

Belt width: 6' (1830 mm)

8' (2440 mm)

Can height: adjustable 100 => 190 mm

Capacity: 300 - 5000 cans/min.

Dry-Off Oven

- · Customized for any type of fuel
- · High efficiency
- · Compact design

None
NOTES

RANGE OF MACHINERY FOR RUBBER

COMPOUND HANDLING, MANUFACTURING

OF TIRE COMPONENTS, TIRE ASSEMBLY,

TIRE CURING AND TIRE TESTING

FOR THE PRODUCTION OF RADIAL

PASSENGER, LIGHT TRUCK, ALL STEEL

RADIAL TRUCK AND BUS AND OFF THE

ROAD TIRES.

For more information see:

www.vmi-group.com

or contact us by e-mail:

sales@vmi-group.com

HEADQUARTERS

P.O.Box 161, 8160 AD Epe The Netherlands sales@vmi-group.com phone +31 578 679111

SALES OFFICES:

sales@vmi-usa.com phone +1 330 9296800

YANTAI, SHANDONG, CHINA

vmiy@vmi.com.cn phone +86 535 6300139

KUALA LUMPUR, MALAYSIA

dennis@isolectra.com.my phone +60 3 78469988

MOSCOW, RUSSIA

office@vmi-group.ru phone +7 495 7950332

RUNDING, GERMANY

info@vmi-az.com phone +49 9971 76139-0

RERGAMO ITALY

sales@vmi-group.com phone +39 0307 365399

SAO BALILO BRAZIL

raraujo@vmi-az.com phone +55 11 22792520

WORLD WIDE SUPPORT

24 HOURS AT CALL: + 31 651 533 912