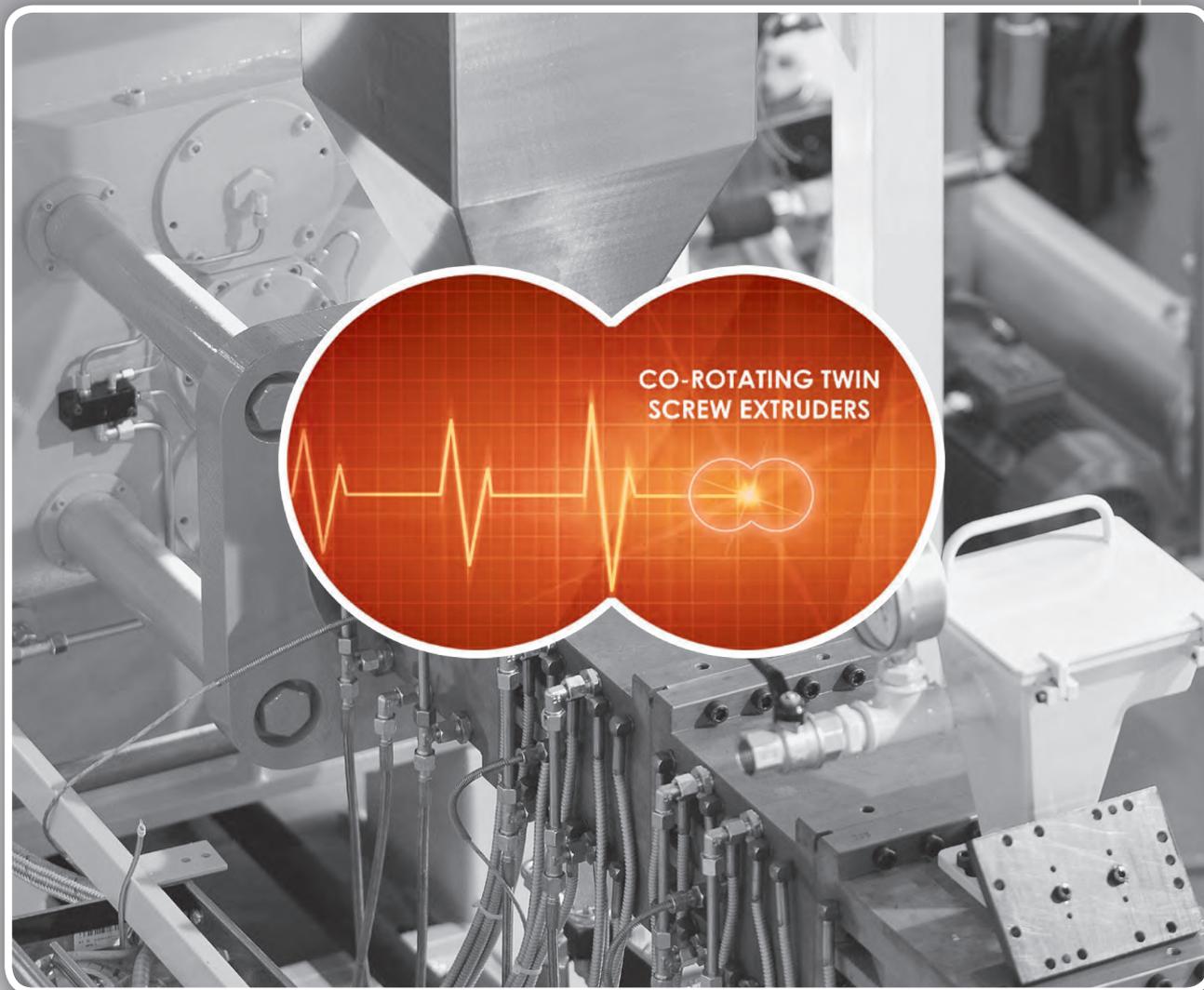


STATE-OF-THE-ART CO-ROTATING TWIN EXTRUDERS



 **ICMA**[®]
SAN GIORGIO

Advanced Compounding and Extrusion Systems

OUR PEOPLE
make the **difference**



For over a century, our family, with its industrial heritage, and all our employees that over the years have worked with us, is witness to the world for the Italian talent and ability that distinguishes **Italy** in facing and conquering international competition in a challenging globalized world.

ICMA SAN GIORGIO SPA is an advanced compounding and extrusion company that is part of our family-owned group and that offers more than 40 years of experience in the production of plastic processing machinery. Based in Italy, ICMA is now one of the leading suppliers of **co-rotating twin-screw extruders** and **turnkey systems** for the global compounding industry.

ICMA possesses a deep knowledge of compounding solutions. Customers depend on ICMA for **high-quality, state-of-the art solutions backed by training**, technical support and a high level of customer service. We are proud to say that our **people at ICMA make the difference** because we have highly trained personnel who reverse their passion and competence to have our customers succeeding in their markets.

We invite you to browse through this brochure with care, as even the smallest of detail can reveal our proud Italian heritage and the high technological degree that we are capable of achieving.

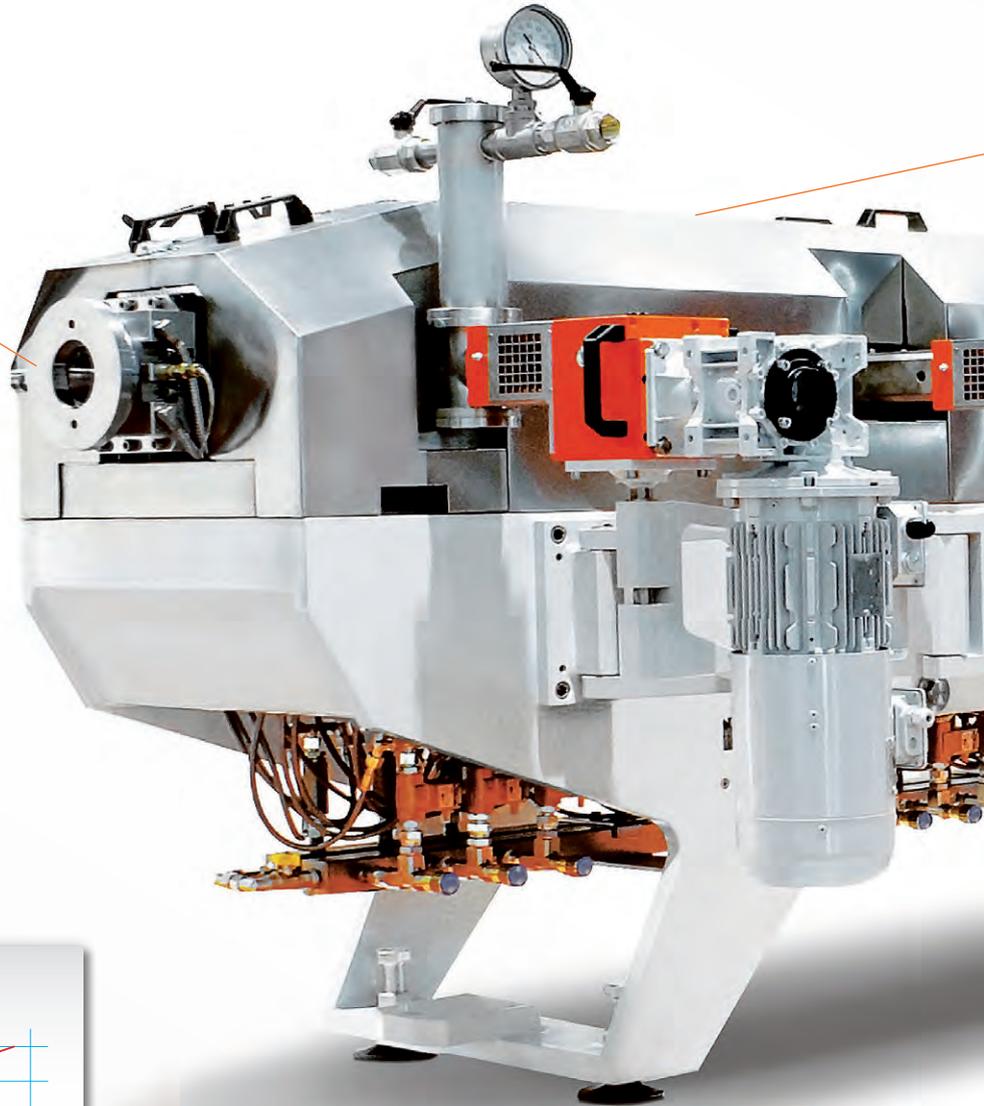
Giorgio Colombo, CEO ICMA San Giorgio



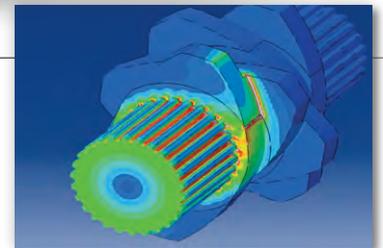
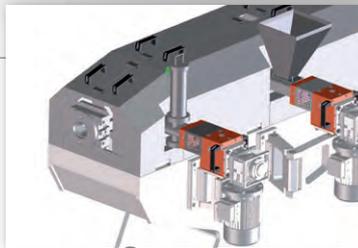
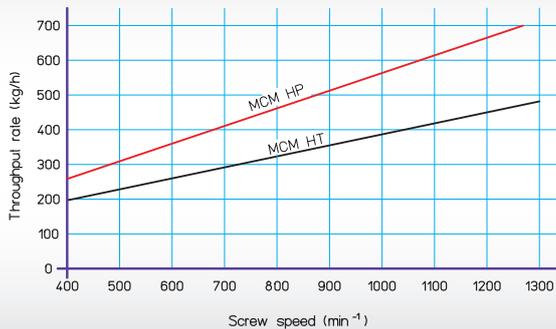
NEXT GENERATION OF CO-ROTATING TWIN-SCREW EXTRUDER



HIGHER FREE VOLUME
D/d at 1,65



MCM42 : Comparison MCM HP vs. MCM HT
Pa 6 + 30% Glass Fiber (Md 85%)



In order to target **production increases** and **energy savings**, these new models of co-rotating extruders combine the advantage of a higher free screw volume with the advantages of higher specific torque, in an energy-efficient design. These powerful machines can handle an extensive array of compounds and applications, and **produce extrusions to the highest quality standards**.



IMPROVED ENERGY SAVING

- AC water cooled motor
- New barrel insulating systems



SPECIFIC
TORQUE
AT 16 N/m cm³

PERFORMANCE

- Highly flexible modular system
- Energy saving, low specific-energy consumption
- High intake capacity of feed screws
- Fast recipe or colour change due to self-wiping geometry
- High plasticisation capacity
- Calibrated control of melt temperature
- High homogenising/distributive mixing capacity
- High dispersive mixing capacity
- Fine-tuning of residence time-shear/elongation stresses parameters balance
- High venting efficiency due to the large surfaces and to the system's modularity

ICMA STRENGTHS

EXPERIENCE, KNOWLEDGE & ENGINEERING

Through **more than 40 years of R&D**, manufacturing and process experience, ICMA possesses a **deep knowledge of compounding solutions**. Customers depend on ICMA for high-quality, state-of-the-art solutions backed by training, technical support and a high level of customer service. Our highly trained staff brings competence and passion to the task of helping our customers succeed.

Our primary focus is compounding processes and equipment for producing pellets or semi-finished pieces. But our scope also encompasses **engineering turnkey systems** and related projects, that include ancillary equipment such as storage circuits for raw materials, gravimetric feeders, and downstream systems for handling, storing and bagging finished pelletized products.

IN-HOUSE MANUFACTURING

Every key part of our extruders is exclusively manufactured by ICMA to ensure high quality of the final system. Our workshop uses **advanced machining technology** to produce precision parts that we also design internally.

SYSTEM-LEVEL CONTROL

Prior to transferring parts to our assembly operation, all components are carefully tested in accordance with procedures of the quality-certified UNI EN ISO 9001 standard. All systems, from extruder component assembly to entire manufacturing processes, are subject to pre- and full-assembly mechanical, -electrical and functional testing before shipment to customers. **This system level control ensures quality manufacturing** and eliminates unnecessary production delays.





CONSTANT DEVELOPMENT

Our experienced laboratory personnel and versatile equipment **help customers solve a variety of research and development challenges**, including both pilot- and pre-production testing.

Our lab facility includes a **pilot line** with a twin-screw co-rotating extruder (MCM/25) for running preliminary suitability and processing tests on a variety of materials and compounds.

Second-phase pre-production testing is performed on our **industrial extrusion line**. The line is, equipped with a full-sized, twin-screw co-rotating extruder (MCM/60HT) suitable for verification of specific production parameters.

We also recently added a new MCM/42HP extruder especially designed for demanding applications.

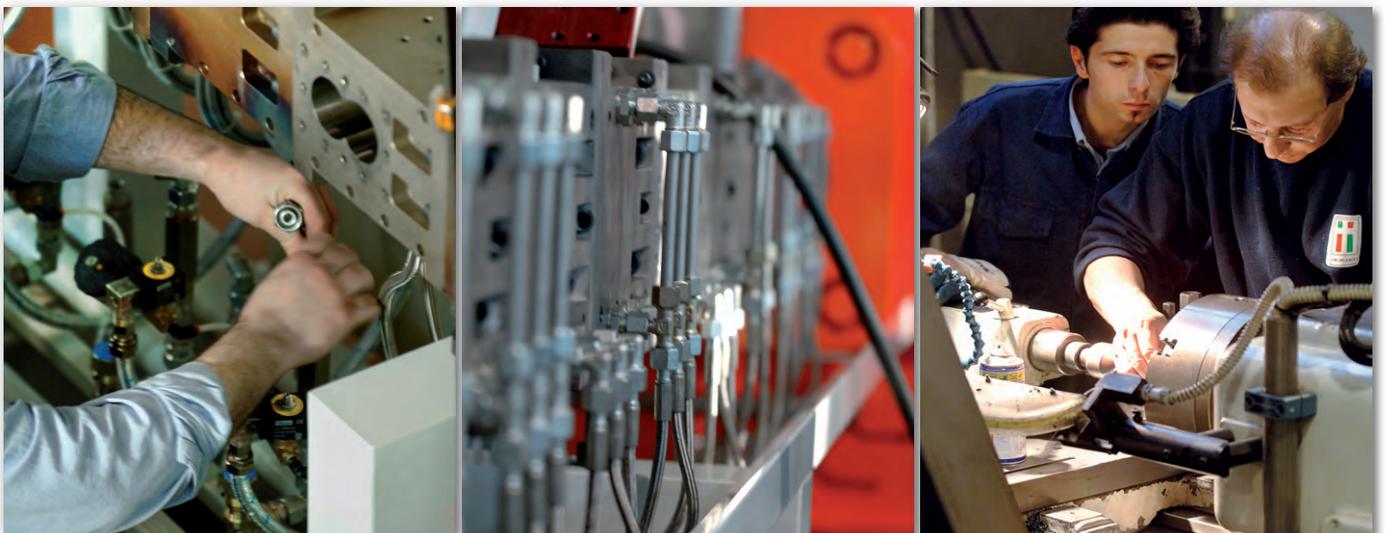
Through more than four decades of experience in the compounding industry and continuous R&D activity, we have developed extensive and proprietary technical and process knowledge.

FLEXIBILITY

ICMA has built its success on the **ability to listen to a customer's needs** and to customize a solution to the exact requirements. The ability to respond and deliver accordingly represents an important factor in a fast-moving world. Big industrial groups claim to be responsive, but often fall short on design flexibility.

PEOPLE

Through years of success, ICMA has built a **highly competent group of loyal employees** at each level. This is an important advantage, since customers can in many cases deal with same people for years. Our philosophy is that ICMA should be the company of choice for our employees as well. They are highly trained, and we consider them our most important asset.



THE MCM CO-ROTATING EXTRUDER FAMILY

ICMA offers four class of co-rotating extruders within the MCM family.

The V class:

Standard high- and low-speed co-rotating extruders are available in ten different sizes, ranging from 40 to 220 mm. Extruders are normally configured for the specific process, and optimized to fully exploit the engineered modularity. High-performance barrels constructed of nitride steel can be supplied in different L/D ratios with air or water cooling system options, and equipped with optional wear-resistant liners.

V		D/d Nominal ratio 1.55				Nominal Specific torque Md/a^3 max 9 Nm/cm ³					
		40 V	50 V	60 V	71 V	80 V	92 V	112 V	140 V	175 V	220 V
Screws diameter	mm	40	50	60	71	80	92	112	140	175	220
Max. screws speed	rpm	1200	1200	1200	1200	1200	1000	900	600	300	300
Motor power	hp	113	225	354	590	824	1072	1488	2150	2158	4318
Motor power	kW	84	168	264	440	615	800	1100	1604	1610	3220
Torque per shaft	ft./lbs.	240	490	770	1290	1810	2840	4350	9400	18880	37760
Torque per shaft	Nm	330	670	1050	1750	2450	3850	5900	12750	25600	51200

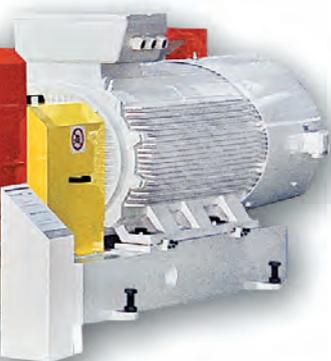




The HT class:

The HT extruders have speeds from 150 to 750 rpm and are available in sizes ranging from 30 to 140 mm. Equipped with modified gearboxes and screw shafts, they can transmit up to 40% more torque than conventional extruders of the same size and screw speed. The HT line is designed especially for those processes requiring high specific energy.

HT		D/d Nominal ratio 1.55				Nominal Specific torque Md/a ³ max 12.5 Nm/cm ³				
		30 HT	40 HT	50 HT	60 HT	70 HT	80 HT	90 HT	110 HT	140 HT
Screws diameter	mm	30	40	50	60	71	80	92	110	140
Max. screws speed	rpm	750	750	750	750	750	750	750	750	750
Motor power	hp	60	101	194	316	516	724	1139	1394	2681
Motor power	kW	45	75	145	236	385	540	850	1040	2000
Torque per shaft	ft./lbs	210	350	680	1100	1800	2534	3990	6100	11730
Torque per shaft	Nm	286	477	925	1500	2450	3435	5410	8270	15900



Features

- Modular design for screw and barrel
- Built-in water circuit for barrel cooling
- Intermeshing screw geometry
- Energy-saving heating system
- Updated electronic control devices

Performance

- Highly flexible modular system
- Energy saving, low specific-energy consumption
- High intake capacity of feed screws
- Fast recipe or colour change due to self-wiping geometry
- High plasticisation capacity
- Calibrated control of melt temperature
- High homogenizing/distributive mixing capacity
- High dispersive mixing capacity
- Fine-tune control for balancing parameters, residence time-shear/elongation stresses
- High venting efficiency due to high surface area and modular design

The HP (HIGH PERFORMANCE) class

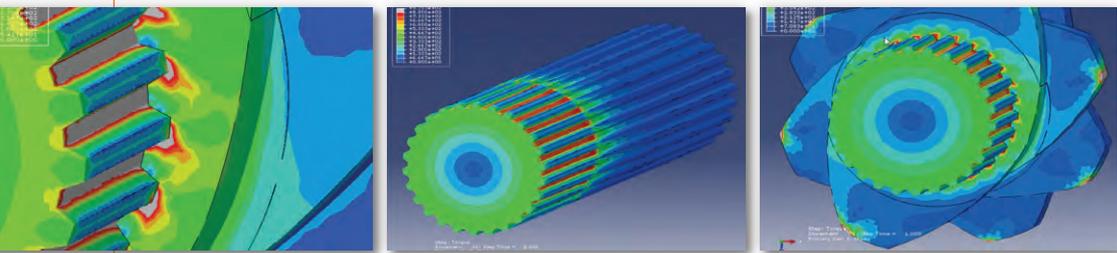
In our continued commitment to co-rotating technology, ICMA has developed a **powerful new class of extruders, the HP (High-Performance) family**, that combines a boosted torque (16 Nm/cm³) with a higher free-volume of the screw channel with a D/d Nominal ratio of 1.65.

In addition to boosting torque and volume, we enhanced this new extruder family with a series of technology solutions to improve energy efficiency. That includes a high-efficiency water-cooled AC motor and an innovative insulation system that reduces heat losses at the barrel. The HP family is designed for the most demanding compounding applications, and capable of processing materials that require high specific energy, with higher yields, while reducing energy consumption.

A clam-shell barrel execution is also available on request.

This line represents the perfect combination of high-torque, high free-volume, and high energy efficiency. The HP family was developed through sophisticated production techniques and attention to material selection. The development process was supported by the mechanical department of the **Polytechnic of Milan**, which ran calculations, laboratory tests and Fem developments to certify final mechanical performance.

The extruder is available at ICMA's laboratory for testing and trials.



HP		D/d Nominal ratio 1.65			Nominal Specific torque Md/a ³ 16 Nm/cm ³			
		42 HP	53 HP	62 HP	74 HP	82 HP	96 HP	112 HP
Screws diameter	mm	42	53	62	74	82	96	112
Max. screws speed	rpm	1300	1300	1300	1300	1300	1100	1000
Motor power	hp	210	433	688	1170	1606	2216	3224
Motor power	kW	157	323	513	873	1198	1652	2405
Torque per shaft	ft./lbs.	420	870	1380	2360	1810	3240	5280
Torque per shaft	Nm	576	1185	1883	3204	4396	7164	11473



The HV (HIGH VOLUME) class

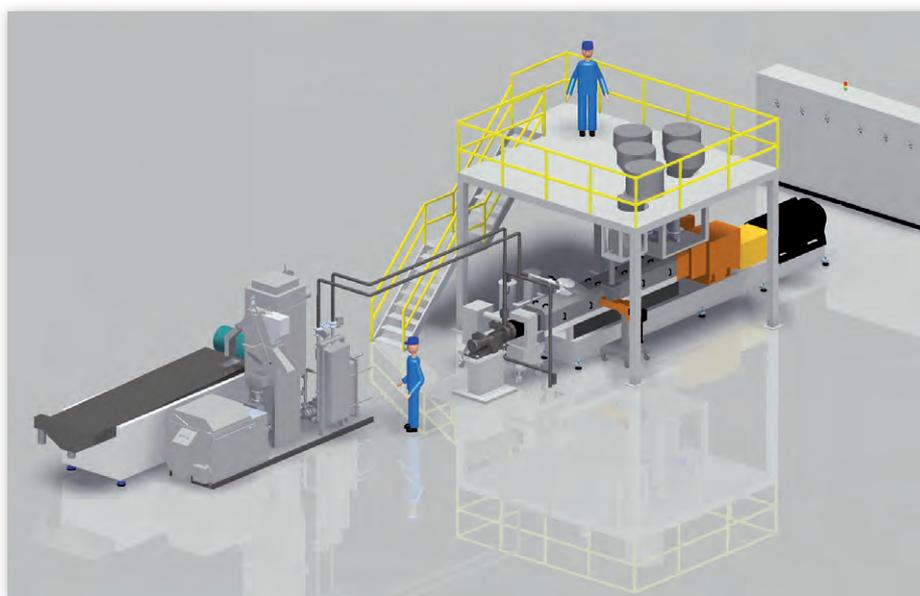
Designed and engineered to satisfy a specific market demand, the **HV Series is based on high free volumes in the melting chamber.**

This concept allows for the highest production performance for compounds requiring a low specific energy.

HV		D/d Nominal ratio 1.8			Nominal Specific torque Md/a ³ 10.5 Nm/CM ³			
		43 HV	55 HV	64 HV	76 HV	85 HV	99 HV	116 HV
Screws diameter	mm	43	55	64	76	85	99	116
Max. screws speed	rpm	1800	1800	1800	1800	1800	1500	1500
Motor power	hp	181	402	603	1072	1475	1984	3217
Motor power	kW	135	300	450	800	1100	1480	2400
Torque per shaft	ft./lbs.	260	580	875	1560	2150	3470	5629
Torque per shaft	Nm	358	795	1192	2120	2915	4708	7632

Special extruders for production of reactive or thermo-sensitive compounds (eg. XPE, PVC, Halogen-free) are also available in three versions:

- Clam-shell Barrel
- Sliding Barrel
- Cascade Design where a co-rotating extruder is combined with a short single-screw discharge extruder for added pressure build up prior to pelletizing.





COMPLETE COMPOUNDING PLANT

Since the very beginning, ICMA has been specializing in providing **turnkey plants** from raw material feeding to downstream equipment.

These engineering capabilities are supported by many successful customers who have chosen ICMA as a **turn-key solution provider**. All phases, from design, construction, assembling, test and final production, can be customized according to customer's needs.

ICMA offers the advantage of a **skilled and agile company** for fast and reliable delivery.

ICMA turnkey solutions incorporate other major brands for equipment not manufactured by ICMA itself, such as dosing and cutting units. So our engineers can choose the best solution for each project according to the specific needs of a customer. ICMA can also offer **personnel training before delivery** to decrease operational risks.

Each line is tested and debugged at ICMA before delivery to allow customers immediate production after assembly at the factory site.



LAB SCALE CO-ROTATING EXTRUDER

ICMA's Lab systems are perfectly equipped for use as development units with the same process engineering features and equipment applied to production scale extrusion lines in order to ensure reliable and safe scale-up. These units are extremely compact and user-friendly.

Modular screws of the co-rotating extruder with several geometries and different barrel designs are combined with a **wide range of ancillary equipment** to deliver maximum flexibility.

TECHNICAL DATA of the CO-ROTATING EXTRUDER

		MCM 18	MCM 25
Screws diameter	mm	18	25
Max. screws speed	rpm	1200	1200
Motor power	kW	8.5	22.5
Torque per shaft	Nm	34	90
Average capacity	Kg/h	5/40	10/80



Who should buy

Companies studying new processes and/or upgrading an existing formulation before going into production. Also ideal for producing small batches.

Advantages

The ICMA lab-scale co-rotating extruder can be an important addition to any operation and can help:

- Minimize operational risks of new formulations before going into production
- Minimize time to market and “payback” period of new developments
- Minimize risks related to “intellectual property” compared to external development
- Improve ROI by decreasing the risks, costs, and time of new development.

LABORATORY

Our experienced laboratory personnel and versatile equipment **help customers solve a variety of research and development challenges**, including both pilot- and pre-production testing. Our lab facility includes a **pilot line** with a twin-screw co-rotating extruder (MCM/25) for running preliminary suitability and processing tests on a variety of materials and compounds.

Second-phase pre-production testing is performed on our **industrial extrusion lines**. The lines are equipped with a full-sized, twin-screw co-rotating extruders MCM/60HT and MCM/42HP suitable for verification of specific production parameters on extruded flat sheets or pellets, or laminated in-line sheets with a combination of different materials.

An advanced **simulation software** is also available, to conduct scientific analysis before and after laboratory tests.



TRAINING

To help customers maximize their investment, we conduct training seminars on co-rotating technology. Our seminars extend beyond basic operations to processing knowledge that can make a difference in a competitive marketplace.

Since 2004, ICMA has also delivered such training services through the European Center for Plastics Applications development (CESAP), sponsored by the Italian Plastic Machinery Manufacturers Association (Assocomplast).



SPARE PARTS AND ASSISTANCE

Our service team operates our **HELP DESK 16 hours/day**.

We offer a **deep inventory** of the most important extruder parts for rapid, “off the shelf” delivery.

We provide in-house support and manufacturing capability for **screw elements, barrel sections** and important mechanical components such as **gear boxes** to help guarantee quality control.



APPLICATIONS

ADVANCED COMPOUNDING SYSTEMS

- Resin compounds with mineral, metallic, organic and fiber fillers
- Masterbatches and masterbatch additives
- Polymeric alloys
- Techno-polymers
- Flame retardant resins, including halogen-free (HFFR)
- TPU (thermoplastic polyurethane)
- WPC (Wood Plastic Compounds)
- Bio-resins and compounds
- Cross-linkable Polyethylene - XPE
- Compounds for Hot Melt adhesive resins
- Polymerization/extrusion of TPU
- Cross-linkable, peroxide-based PE, for low/medium tension cable coating with cascade compounding system

HIGH-CAPACITY COMPOUNDING SYSTEMS

- Petrochemical plants
- PVC, soft or rigid high-filled and medical grades (also without pre-blending operations)





THERMOPLASTICS

- TPO polyolefin matrix, modified with EPDM
- TPV polyolefin matrix, modified with vulcanizable EPDM
- TPE styrene co-polymer SBS, modified with styrene resins or polyolefin
- Styrene co-polymer SEBS base, modified with styrene resins or polyolefin TPE
- TPU thermoplastic polyurethane

RECYCLING

- Recycling system for polyolefin waste with a high water or pollution content
- Recycling/compounding system of polyolefin waste with a wide broad of viscosity/density, reinforced or filled
- Recycling/compounding system of plastic textile yarn waste reinforced or filled
- Recycling system of PET bottle flakes without pre-drying and crystallization



IN LINE EXTRUSION AND CALENDARING SYSTEM FOR FOIL AND SHEET AND RECYCLING APPLICATIONS

For additional information regarding the applications of ICMA's proprietary co-rotating technology and extruders in the specific field of Direct extrusion and Recycling, please also ask for our Application brochure.

100% MADE IN ITALY

ICMA
SAN GIORGIO Advanced Compounding and Extrusion Systems

ONE CO-ROTATING HEART IS BEATING IN OUR SYSTEMS

CO-ROTATING TWIN SCREW EXTRUDERS

COMPounding ADVANCED RECYCLING NATURAL FIBERS DIRECT EXTRUSION LAB SYSTEM

DIRECT EXTRUSION IN LINE COMPOUNDING & EXTRUSION SYSTEM

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ADVANCED RECYCLING COMPOUNDING TECHNOLOGY FOR RECYCLING SYSTEMS

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NATURAL FIBERS **Naturcore™**
NATURAL FIBRES COMPOSITE & WPC

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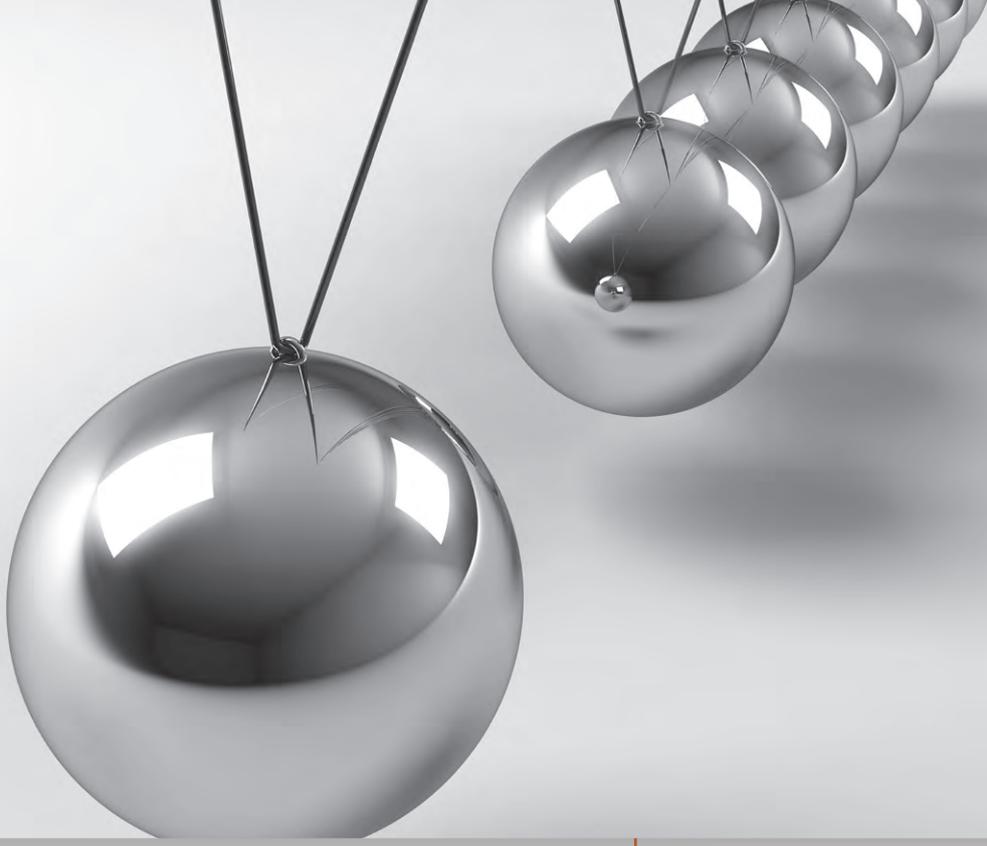
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COMPounding ADVANCED RECYCLING NATURAL FIBERS DIRECT EXTRUSION LAB SYSTEM

LAB SYSTEM COMPOUNDING SOLUTION FOR LABORATORY

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OUR COMPETENCE
your needs





Advanced Compounding and Extrusion Systems

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