INDIA

CUMI – Making Materials Matter

Carborundum Universal Limited (CUMI) is one of the leading global material-sciences company with presence in abrasives, ceramics, refractories and electro-minerals. Today, CUMI is one of the very few companies in the world to have fully integrated operations in materials. The organisational purpose of CUMI is – Making Materials Matter – and every product and business within CUMI tries to further this purpose and touch human lives in one way or the other.

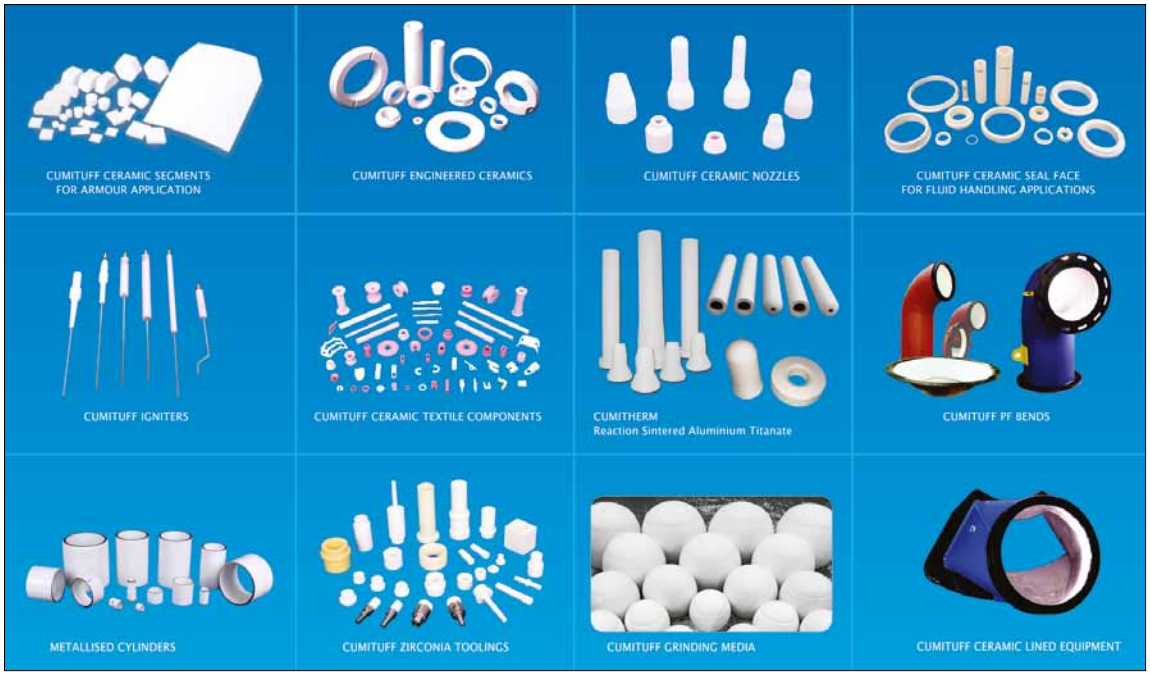

Fig. 1
Overview product portfolio (Industrial Ceramics Division)

CUMI was started as a tripartite venture between the Murugappa Group/IN, Carborundum Co./US and the Universal Grinding Wheel/GB in the year 1954. The company pioneered the manufacture of coated abrasives and bonded abrasives in India in addition to the manufacture of super refractories, electro-minerals, industrial ceramics and ceramic fibres. Today, the company's range of over 20 000 different varieties of abrasives, refractory products and electro-minerals are manufactured in 25 locations across the world.

With state-of-the-art facilities and strategic alliances with global partners, CUMI has achieved a reputation for quality and innovation. Almost all of CUMI's manufacturing facilities have received the ISO 9001:2008 accreditation for quality standards. A well connected marketing and distribution network of offices and warehouses in India and abroad, ensure that service to customers is given prime importance.

CUMI's constant innovation and product up-gradation, through in-house R&D and strategic alliances with global leaders in advanced ceramics, abrasives and materials, have ensured its market leadership.

CUMI's products are being exported to 43 countries spread across North America, Europe, Australia, South Africa and Asia.

For the financial year 2016–2017, CUMI achieved a consolidated turnover of INR 22,31 billion (USD 344 million). The

Fig. 2 a
Rajesh Khanna, President Ceramics Division

Fig. 2 b
Shyam Rao, Senior Vice-President Ceramics Division

Industrial Ceramics Division's turnover for 2016–2017 being at USD 34 million (Fig. 1). Close to 70 % of the revenues of CUMI Industrial Ceramics comes from Exports markets. During a visit at the Hosur plant in India, Rajesh Khanna, President Ceramics Division, and Dr Shyam Rao (SR), Senior Vice-President Ceramics Division, gave us insights on the strategy for the activities in the ceramics sector (Fig. 2 a–b).

CA: *What where the milestones in the 25 years of CUMI history?*

CUMI: The Industrial Ceramics (IC) Division of CUMI was started in the year 1991. It was a pioneering step taken by the CUMI Management under the leadership of M. V. Murugappan, former Chairman of CUMI, with the objective of bringing advanced ceramics technology into India and service the demands of Indian Industry. The business was established in a technology partnership with a leading global advanced ceramics company. This partnership was in place for a period of 10 years. Since the termination of the technology partnership, CUMI-IC has been developing all formulations and products in-house through a dedicated R&D team (Fig. 3).

Over the years the Industrial Ceramics Division, with its strong focus on technology, innovation and applications, has strengthened its position in the global markets and gained repute as a high quality supplier in each of its product lines. Today, over 70 % of the revenues of CUMI's Industrial Ceramics Division comes from the export markets.

There have been several important milestones that the division has crossed in the last 25 years. The significant one has been the decision to build world-class manufacturing capabilities and technology in each of the three product segments of the division, in the late 1990's and early 2000. This decision was an outcome of an increased focus on the international markets.

Today, the division has a capacity of 7200 t/a wear resistant ceramics and 1 million metallized alumina cylinders (for

Fig. 3
R&D Department: thermal analysis (l.), powder characterisation (r.)

vacuum interrupters) per year. In the last decade, the division acquired several key domestic and global customers. An important milestone for the division in 2015 has been the acquisition of assets and technology related to the manufacture of metallized alumina cylinders from NGK Spark Plug Co/NTK Technical Ceramics/JP, a company that we have always held in high respect and had benchmarked. With this plant coming on stream, we would have a capacity of 1,7 million cylinders per year, making us the second largest producer in the world.

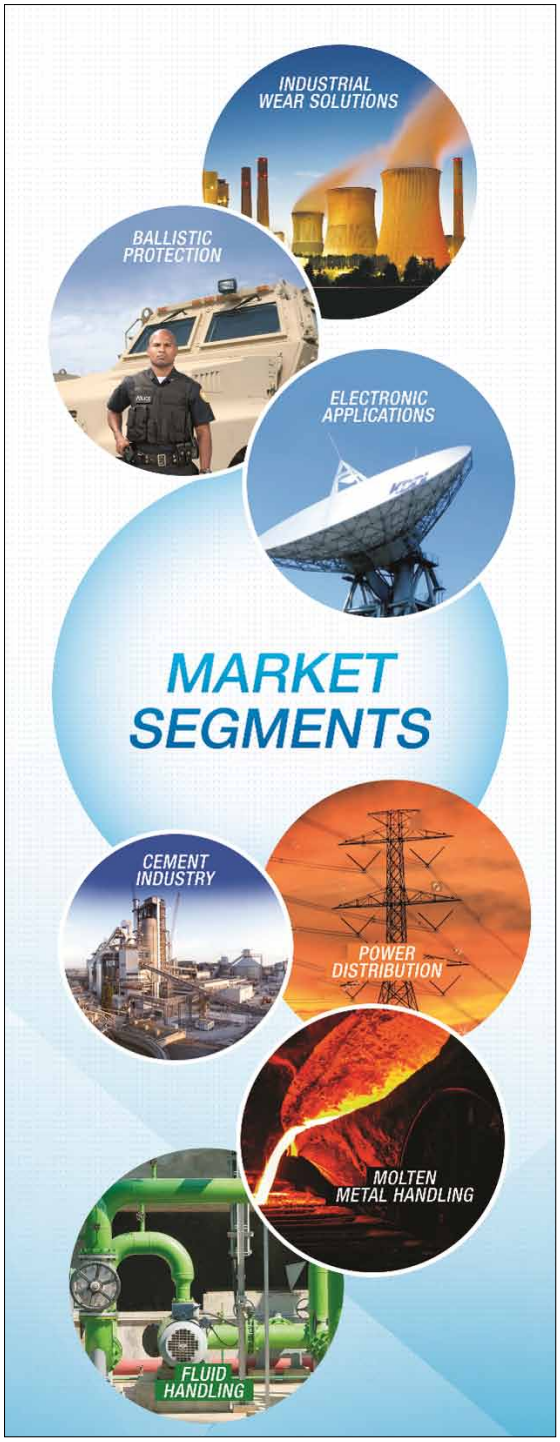

Fig. 4
User segments for CUMI products (market)

In August 2016, we have also inaugurated a new state-of-the-art facility for R&D, which houses some of the latest equipment for advanced material characterization and research. This would help the division develop next generation of ceramic products for applications in electronics, medical, aviation and space, etc. The division has also been recognized as one among the top 25 innovative organizations in India by Confederation of Indian Industry (CII) in the year 2015.

CA: *What are today the most important user segments of advanced ceramic components from CUMI?*

CUMI: The advanced ceramic products manufactured by CUMI Industrial Ceramics Division find use in a wide range of applications. Today, the strength of the division lies in offering products chosen from a wide range of base material formulations selected based on the properties that the end-use demands (Fig. 4).

Some of the key end-use segments are: medium and high voltage electrical equipments (CUMI IC supplies metallized alumina cylinders for the manufacture of vacuum interrupters), wear resistant liners and lined equipment (CUMI IC supplies these for wear protection in bulk material handling, cement, steel, mining and the like), fluid handling (engineered precision ceramics for sealing applications in water pumps, chemical pumps, etc), size reduction (alumina grinding media and ball mill liners for use in size reduction), ballistic protection (monolithic ceramic armour plates and ceramic tiles for vehicle armour), ceramics for general engineering (like ceramic nozzles for argon arc welding, shot blasting), ceramic injection moulded components (for applications in textile, etc), thermal applications (magnesia partially stabilized zirconia for steel metallurgy and aluminium titanate for non-ferrous metallurgy), automotive applications (ceramic insulator bodies for igniters), solid oxide fuel cells (structural ceramics for SOFC's) to name a few.

CA: *Do you have strategic partnerships to develop further the product portfolio?*

CUMI: Yes, the Industrial Ceramics Division is working on strategic partnerships with external partners to further develop the product portfolio. There is a strong focus on technology and partnerships with technology specialists, companies and research institutions have been fostered over the last several years in the division and this has yielded substantial results in the form of business.

Going forward the division intends to focus on the next generation of materials and processing technologies, for developing which we are working synergistically with several partners.

CA: *What are the key technologies at your production site – are further investments planned?*

CUMI: The IC division has several core technologies on which the business has been built. We have strong capabilities in metallized ceramics today, which have applications not just in the electrical industry but also in semiconductor electronics, medical devices, to name a few. Wear resistant

Fig. 5
Clean room for metallization

ceramics has been the foundational technology on which the business was built and it continues to be our strong area. In addition, we have strong capabilities in stabilized zirconia products for advanced wear and corrosion resistance, stabilized zirconia for thermal applications, reaction bonded silicon carbide technology, extrusion and ceramic injection moulding technology.

Another interesting competence that we have built over the years, as an innovation, is developing aesthetic ceramics using advanced materials, which has resulted in a separate product line. We are also working on medical ceramics and over the next three years we have plans to bring some products out in this segment.

The IC division has chalked out a clear strategy across three segments – core, adjacent and transformational and investment plans have also been drawn up for these three segments.

CA: *What are the materials processed, where do you source the raw materials?*

CUMI: The IC division today processes – several formulations of high-alumina (90–99,7 % purity), stabilized zirconia (magnesia stabilized, yttria stabilized), aluminium titanate and silicon carbide.

We source our alumina from some of the leading global producers of speciality alumina based in Europe and Japan. Same is the case with our other products. We are also working with our Electro-Minerals Division for some of the more recent products that we have developed, like zirconia nozzles for steel metallurgy, where we are using the raw monoclinic zirconia from ourelectro-minerals division.

CA: *Is all R&D done in-house or also in cooperation with external partners?*

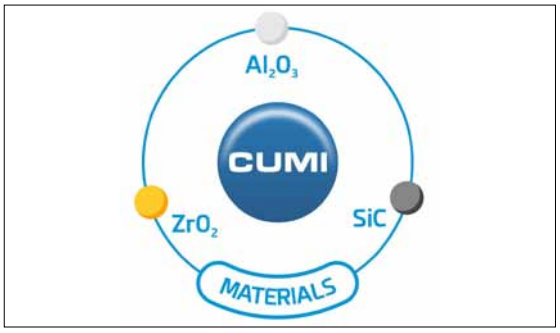

Fig. 6
Materials spectrum processed by CUMI

CUMI: The division has a strong focus on R&D. This has been further intensified with the investment in a new state-of-the-art R&D that we have opened in August 2016. We have a healthy mix of in-house R&D projects and collaborative R&D projects with external partners. Another focus area for the division is the collaborative R&D with other divisions of CUMI (like Abrasives, Refractories and Electro-Minerals) and also with other companies in the Murugappa Group.

The IC division is also a member of CERAM Research UK. In addition, we have collaborative projects with ISRO in India and have recently completed a transfer of technology from SAC-ISRO India for thin film metallization techniques on ceramic substrates (Fig. 5). In parallel, the division is also working with National Aerospace Laboraties (NAL) on the development of a process for the manufacture of ceramic substrates.

CA: *Which R&D projects have been launched?*

CUMI: In recent years, R&D has helped in develop and commercialize several new products. We launched our CUMITHERM range of products for use in thermal applications – these include aluminium titanate products for use in non-ferrous applications and magnesia stabilized zirconia products for use in steel metallurgy. In addition, the R&D has also developed and commercialized products like metallized ceramics for high vacuum semiconductor applications. In the category of wear resistant ceramics, again several new offerings have been developed and commercialized, like ceramic lined rubber hoses for dredging applications, special wear coatings, etc. (Fig. 6).

While the above are examples of our R&D having developed products for the immediate and medium-term market needs, a considerable amount of time is also spent by the R&D on futuristic projects like metal matrix composites, medical ceramics, thin film metallization on ceramics, ceramic substrates, and the like.

CA: *Which key equipment is in the R&D lab to fulfil the needs of research projects?*

CUMI: The R&D houses several equipment for important ceramic material and product characterization. We have organized our equipment into material characterization, advanced material microstructure characterization, and advanced dilatometry (DIL) for precise profiling of dimensional changes for a given temperature range.

Fig. 7
Overview CUMI plant in Hosur/IN

For example, for the purpose of particle and granulate size characterization, we use equipment like sedigraphs and also laser-diffraction based particle size analyser. We also BET – surface area analyser for measurement of specific surface area. We extensively use the NETZSCH/DE dilatometer during the process of material and product development. In addition, each of CUMI's R&D uses complementary facilities available in other R&D's of CUMI's business units.

CA: *What is the strategy to enhance export business, what is the market position in India?*

CUMI: We have adopted strategies, depending on the product and application, to grow our export business (Fig. 7).. As explained earlier, we have close to 70 % of our revenues coming from the export markets.

In wear resistant ceramics, partnerships with OEM's, working with subsidiaries and market representatives, and offering customized wear services have helped us improve our market standing. Today, we have a strong competency in offering installation services across industries – bulk material handling, cement, etc. – and this has helped us greatly In addition, our specialists also conduct wear studies, which help the customer in predictive maintenance and better planning of repairs and maintenance.

An example of partnership is that of our association with our subsidiary in Australia, CUMI Australia Pvt Ltd (CAPL), which has helped improve our presence in the demanding Australian mining and coal washery segment. CAPL uses our ceramics and offers comprehensive products and solutions. In our technical ceramics business, i.e., metallized ceramics and engineered ceramics, the strategy we have adopted is that of building a strong technical and application oriented relationship with our customer, and working on joint development programs. On the marketing front, we focus on key account management and service excellence through product availability points closer to the customer.

CA: *Which customer service can you provide abroad?*

CUMI: Today, we have a very strong product distribution and service capability globally. We have product availability points, market representatives and subsidiaries in key geographies and this has enabled us widen our reach. We also have a very agile marketing team, that has strong customer-centric approach and is always available to interact with customers and service them. We have also joined the CERAMICS APPLICATIONS (former) TASK consortium and look forward to greater interactions in the days ahead.

CA: *Thank you for talking to us.* KS