

Confidential Report

Rubber Chemical Consultants Ltd



Furnace Carbon Black Industry & Markets 2018 Past-Present-Future (8th Edition)

SAMPLE REPORT

Rubber Chemical Consultants Ltd | 9, Harman Road, Sutton Coldfield, West Midlands, B72 1AH
UK Registered Company, no: 06863349

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Furnace Carbon Black Industry & Markets 2018

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Sample Report

Please refer to separate contents document for full details on sections, figures and tables.

Full report is 177 pages with 14 Sections, 88 Figures and 139 Tables.

An Excel workbook is also provided with the full report, this contains data from most of the tables and figures in the pdf report.



2 EXECUTIVE SUMMARY

This summary details furnace carbon black volumes in kMT (thousands of metric tonnes) and values in MM\$ (millions of United States Dollars, USD).

2.1 SCOPE

Product: This report focuses solely on furnace carbon black. Other competing or complimentary product types are discussed but are not analysed in detail.

Markets: This report covers the main furnace carbon black market segments of tire, rubber goods (known as mechanical rubber goods or MRG) and plastics. The segments of inks, coatings and specialist applications are included in the category 'other segments'. Analysis of the tire, MRG and plastics segments is therefore focused with drill down into appropriate sub-segments and applications. Other segments are analysed at the top level, ensuring the total furnace carbon black market volume is captured.

Geographies: This report covers the global furnace carbon black industry, the global geographies are split into 10 regions: Africa, China, CIS, Europe, India, Middle East, North America, North Asia, South America and South Asia. Each region is subdivided into the appropriate countries and in some instances states/provinces.

Time Frame: This report covers the period 2011 to 2030.

Market Volumes: Volumes for 2011 to 2017 are modelled and adjusted to an average value from a range of industry sources, volumes for 2018 to 2030 are projected using stated modelling techniques.

Market Values: Market values cover the years 2016, 2017 with projected values based upon the respective yearly volume estimate, segment mix and 2017 price.

Historic Regional Pricing: This is developed using RCCL proprietary modeling system verified by market pricing spot checks.

2.1 OBJECTIVES

The key report objectives are as follows:

- Provide an overview of the furnace carbon industry, manufacturers and changes.
- Analyse current and future manufacturing trends and technologies.
- Provide market insight for the primary furnace carbon black markets.
- Analyse carbon black manufacturer costs and selling prices.
- Analyse trends in international trade.
- Discuss market values, modelled values and international trade values.
- Estimate market volumes for furnace carbon black.
- Estimate market values for furnace carbon black.
- Determine industry utilisation rates.



2.2 MARKET DRIVERS

Figure 2.1- Furnace Carbon Black Primary Markets, Drivers and Challenges



Tire Market:

➤ *******d**

Increased ***** is a *** driver and ** strongly related ** economic growth *****s. Automotive ***** is growing ***** strongly in **** and where *** car parc ***** in the ***** nations has ***** a point ***** it will ***** influence replacement ***** now and ** the future.

➤ *******y**

This ***** product mix *** technologies generally ***** carbon black ***** due to *** use of ***** in place ** carbon black ** well as ***** weight tire *****s. While ***** the realm ** PC/**V/LT ***** this is ***** important in *** truck radial **** segment where ***** efficiency and ***** management are *****t.

➤ *******s**

Tire ***** are investing ***** in value ***** product lines* these include ***** PC/SUV tires ** many different ***** categories (e.g. winter tires, ultra-high performance, all season). For ***** black usage *** trend to ***** tire sizes ** significant as **** counteracts the ***** in use ***** replacement by ***** or light *****g. Other **** value lines ***** , ** and ***** s.

Rubber Goods (MRG) Market:

➤ *******d**

Automotive ***** is a *** driver, ***** growth is ***** by industry ***** towards light ***** and recyclable *****s. The *** of TPE/V materials ** gaining ground ***** in weatherstrip *** moulded seals* these components ***** far less ***** black.

➤ *******h**

Key **n-***** segments include the ***** and construction *****s, ***** rely on ***** growth as **** as industry ***** performances. The ***** in mining *** oil & **



has had * significant impact ** volumes over *** past five ****s, **** is beginning ** recover and *** prospects look ***** into ***8.

- *****s

Differentiation ** possible with ***** (low *****e) ***** for sealing *****s. Value *** be achieved ** niche applications ***** specific performance **** as low *** or conductivity.

Plastics Market:

- *****e

Growth ** plastics use ** the automotive ***** is allowing ***** in specialist ****r-**** applications as well ** other constructional *****s.

- *****h

Commodity **** applications generally **** on regional/country economic *****h. This ***** both agricultural ***** (such ** film) ** well as **** and infrastructure *****t. Growth ** the developing ***** is expected ** drive this.

- *****d

Value ***** products include ***** applications found ** the wire * cable industry ** well as ***** and industrial (packaging). These ***** along with **** colour applications ***** significant value *****n.

2.3 MARKET VOLUMES

Market volumes include provision for product technology changes driven by regional legislation & consumer demand patterns. All volumes are in thousands of metric tonnes, kMT.

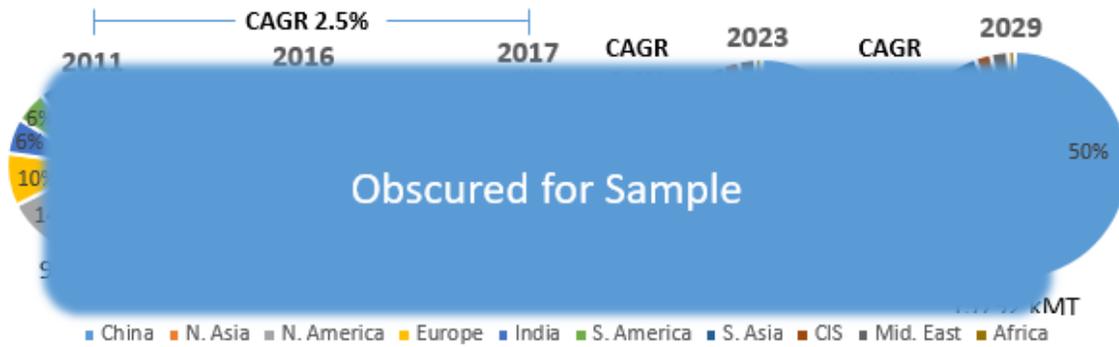
Figure 2.2 - Global Market Volumes by Region and Year for All Segments



- **6/** growth was *.%** from ***** ** to ***** **T.
- Short term *****7/** is forecast ** *.%** with ***3/** CAGR forecast at *.%**.
- Regions with *** highest short ***** (**7/**) ***** market growth (kMT) **e:
 - China (**3) >> ***** (**8* >> N* America (***) > S. Asia (**4) > N. Asia (**5)



Figure 2.3 - Global Market Volumes by Region and Year for Tire Segment



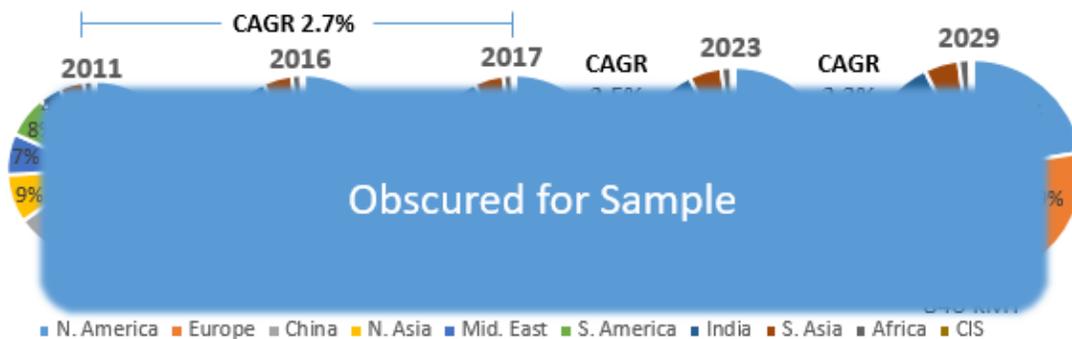
- ****/** growth *** *.*% from ***** kMT to ***** kMT.
- Short term **** ***/** is ***** at *.*% with ****/** growth ***** at *.*%.
- Regions with *** highest short **** (****/23* potential market ***** (kMT* are:
 - China (****) >> India (***) >> S. Asia (***) > N. America (***) > N. Asia (**)

Figure 2.4 - Global Market Volumes by Region and Year for MRG Segment



- ****/** growth *** *.*% from **** kMT to **** kMT.
- Short term **** ***/** is ***** at *.*% with ****/** growth ***** at *.*%.
- Regions with *** highest short **** (****/23* potential market ***** (kMT* are:
 - China (***) > N. America (**) > India (**) > Europe (**) > N. Asia (**)

Figure 2.5 - Global Market Volumes by Region and Year for Plastics Segment





- ****/** growth *** *. % from *** kMT to *** kMT.
- Short term **** ***/** is **** at *. % with ****/** growth **** at *. %.
- Regions with *** highest short **** (***/23* potential market **** (kMT* are:
 - China (**) > N. America (**) > Europe (**) > India (**) > S. Asia (*)

2.4 MARKET VALUES

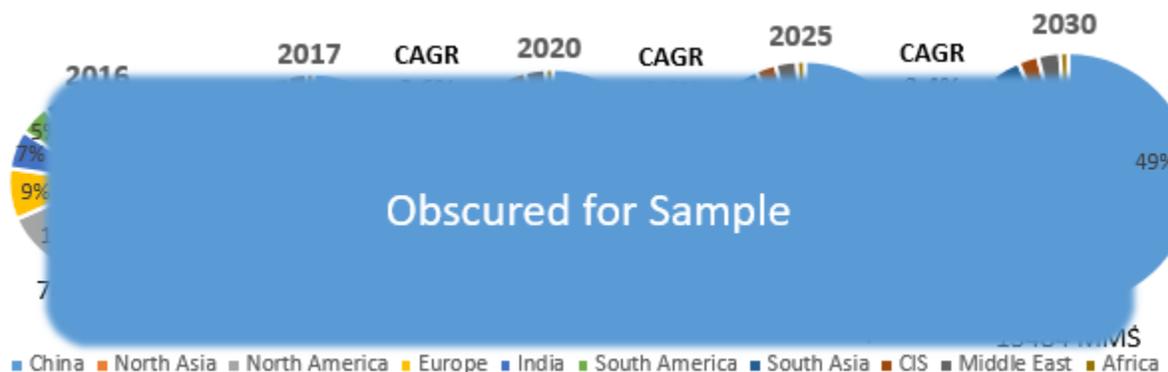
Market values were estimated from average segmental regional prices. Unadjusted 2017 prices were used for forward years. All values are in millions of United States dollars, MM\$.

Figure 2.6 - Global Market Values by Region and Year for All Segments



- ****/** growth *** *. % from **** MM\$ ** ***** MM*.
- Short term **** ***/** is **** at *. % with ****/** growth **** at *. %.
- Regions with *** highest short **** (***/20* potential market **** growth (**\$) are:
 - China (***) >> India (***) >> N. America (**) > M. East (**) > N. Asia (**)

Figure 2.7 - Global Market Values by Region and Year for the Tire Segment



- ****/** growth *** *. % from **** MM\$ ** ***** MM*.
- Short term **** ***/** is **** at *. % with ****/** growth **** at *. %.
- Regions with *** highest short **** (***/20* potential market **** growth (**\$) are:
 - China (***) >> India (***) >> N. America (**) > M. East (**) > N. Asia (**)

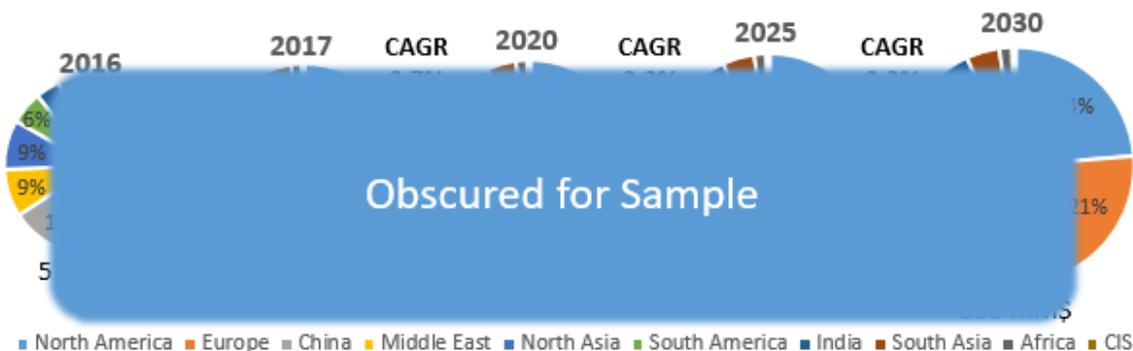


Figure 2.8 - Global Market Values by Region and Year for the MRG Segment



- ****/** growth *** **.% from **** MM\$ ** **** MM\$.
- Short term **** ***/** is **** at *. **% with ****/** growth **** at *. **%.
- Regions with *** highest short **** (***/20* potential market **** growth (**\$) are:
 - China (**) >> N. America (**) > India (**) > Europe (**) > N. Asia (**)

Figure 2.9 - Global Market Values by Region and Year for the Plastics Segment



- ****/** growth *** **.% from *** MM\$ ** **** MM\$.
- Short term **** ***/** is **** at *. **% with ****/** growth **** at *. **%.
- Regions with *** highest short **** (***/20* potential market **** growth (**\$) are:
 - China (**) >> N. America (*) > Europe (*) > M. East (*) = India (*)

2.5 INDUSTRY DRIVERS

➤ Environmental Issues

The ***** for ***** controls ** SOx* NOx *** PM ***** continues ** drive ***** standards ***** an ***** number ** regions. Stricter ***** of ***** in ***** during **** had * significant ***** on *** supply*demand ***** in ****. In *** USA* the ***** pending *** disputes **** settled. All **** US ***** manufacturers *** now ***** to ***** capital ***** for ***** to ***** . These ***** costs* combined **** increased ***** costs* will ***** market ***** adjustments. A ***** of ***** adjustments **** already ***** place * RCCL ***** additional *****



adjustments. In ****, local ***** forced * temporary ***** of *** of ***** facilities ** the *** of **** and *** *****; *** had ** impact ** product ***** in *** domestic ***.

➤ ***** *****e

Manufacturers ***** to ***** product ***** with ***** to ***** generation. The ***** towards ***** value ***** continues **** a ***** of ***** reconfiguring *****/production ***** for ***** products. In **** of *** poor ***** conditions ** the **** few ***** a ***** of ***** have **** removed ***** (***** grade) ***** capacity.

➤ ***** *****s

The **** market ***** over ***** years **** led ** plant ***** in **** instances *Europe* as **** as ***** of ***** capabilities. Shifting ** specialist ***** production ** lower **** manufacturing ***** is * good ***** of ****. Costs **** also **** reduced ** SGA ***** and ***** are ***** that ***** programs **** also ***** , this ***** have ***** in *** near ***** in ***** of ***** costs. Process ***** continues ** be * big ***** for ***** , manufacturers *** looking ** programs ** reduce ***** costs ** well ** leveraging ***** types *** increased *****.

➤ ***** *****s

The ***** mix *** feedstock *** been ***** by *** current ***** climate* the ***** for ***** feedstock ***** has ***** faster **** industry ***** used *** contract ***** and **** has *** to *** need ** impose ***** feedstock ***** premiums *which *** not ***** been ***** in *** poor ***** environment*. China ** particular *** seen ***** feedstock ***** increases ***** may ***** international ***** balances ** the *****.

➤ ***** *****s

Manufacturers *** increasingly ***** to *** additional ***** to ***** product *** by ***** on ***** grades **** differentiated ***** . While ***** this *** the ***** of *** big ***** (****, Orion and ****) there ** now * much ***** specialist ***** offering ***** multiple ***** , particularly *** MRG *** plastics ***** . Within *** tire ***** a ***** of ***** are ***** N*** types ** achieve **** value.

2.6 INDUSTRY OUTLOOK

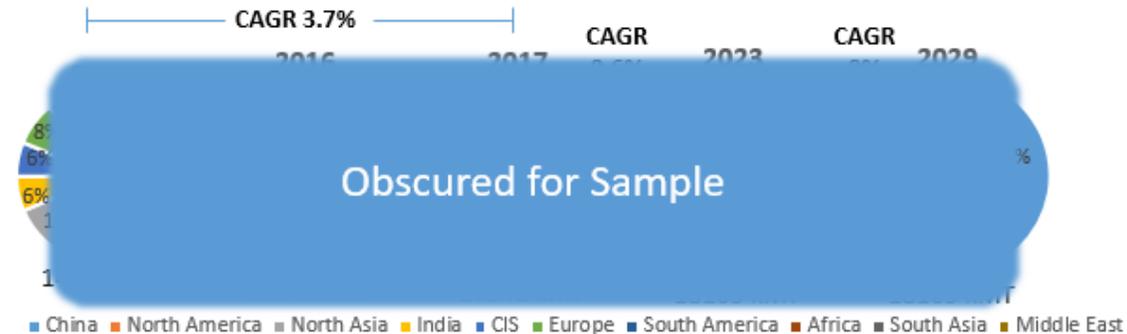
➤ Production Capacity (Figure 2.10)

- Manufacturing capacity ***** at a **** of *.**% over for ****/**, with the **/** increase being *.**%, forward volume increases *** currently projected ** be low.
- Increased investment ** key manufacturers ** anticipated in *** near future ** view of ***** market conditions* this may ** accelerated due ** the environmental ***** in China ***** may remove **** of the ***** capacity.
- The situation ** North America ** complicated with **** conflicting considerations ***** as manufacturing ***** in the **, potential future ***** restrictions both ***** NAFTA



and *****.

Figure 2.10 - Global Furnace Carbon Black Production Capacity by Region and Year



➤ **Market Prospects**

General ***** conditions ***** to ** moving ***** a ***** of ***** for ***** carbon ***** manufacturers. The ***** overcapacity ** recent ***** is ***** less ** an ***** due ** changes ** China. While ***** costs *** still ** issue* these *** more ***** overcome **** contract ***** are **** favourable *** to *** improved *****/demand *****.

➤ **International Trade**

China *** Russia ***** the ***** export ***** from * volume *****. This ** set ** continue **** Russia ***** the ***** to ***** China *** export ***** in ****. The ***** situation ** China *** accelerate **** reversal ** rankings ***** Russia ***** global ***** reach.

The ***** increase ** imports ** North ***** has *** materialized ** date. RCCL ***** that ** ***** the ***** , there **** be ** urgent **** for ***** North ***** capacity ***/or * change ** the *****/export *****. Russian ***** have *** up *** necessary ***** for ****, however* the ***** market ***** on * global ***** may **** North ***** a **** attractive ***** than ***** regions.

➤ **Manufacturers**

Major ***** have **** reporting ***** financial ***** moving **** the ***** half ** ***** the ***** quarter ** *****. Recovering **** a ***** period ** poor ***** conditions *especially ** the ***** segments* will ***** additional ***** on ***** maintenance ***** which *** always ***** back ***** poor ***** conditions. Key ***** are **** positioned ** capitalise ** the ***** markets ***** rationalised ***** and ***** portfolios ** maximize *****.

Renewed ***** in *** market ** evidenced ** Cabot's ***** expansion ***** for ***** and ***** across *** global *****. Phillips ***** Black ** also ***** expansions ***** India. Other ***** already ** progress* such ** Omsk ***** Belarus ***** , are ***** to ***** . A ***** of ***** producers ** China *** also ***** to *** capacity.



3 INTRODUCTION

This section provides the framework for this market research report. Definitions and scope provide critical components necessary for a clear understanding of the report and conclusions. The objectives provide the building blocks for the market report. Information sources allow the user to understand the level of detail and reliability of the data.

3.1 DEFINITIONS, ABBREVIATIONS AND NOMENCLATURE

Definitions, abbreviations and nomenclature are provided in **Table 3.1**.

Table 3.1 - Abbreviations, Definitions & Nomenclature

Item	Definition/Description
Aero	Aircraft industrial segment
Africa	All countries on the African continent
Agri	Agricultural segment
Auto	Automotive industry segment
AO	Anthracene Oil
CAGR	Compound annual growth rate
China	Mainland China
CIS	Countries outside of the European Union plus CIS countries: (Albania, Armenia, Azerbaijan, Belarus, Bosnia, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Montenegro, Russia, Serbia, Tajikistan, Ukraine, Uzbekistan)
Constr	Construction industry segment
CT	Raw coal tar
CTO	Coal Tar Oil (covers subtypes including AO, blend oil, raw coal tar and carbon black oil CBO)
CUV	Crossover Utility Vehicle
Dmst	Domestic (consumer) segment
Energy	Energy (oil, gas, renewables) segment
ET	Ethylene Tar Residue (also known as steam cracker residue)
Europe	Countries of the European Union plus Norway and Switzerland
FCC	Fluidised Cat Cracker Residue (also known as decant oil)
GTRCDB [®]	The RCCL Global Tire & Rubber Chemicals Database [®]
India	Mainland India
JV	Joint Venture
kMT	Thousands of metric tonnes
LFY	Last full financial year
LT	Light Truck Tire
Medical	Medical segment
Mine	Mining industrial segment
M. East	Countries around the Persian Gulf: (Afghanistan, Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Pakistan, Palestine, Qatar, Saudi Arabia, Sudan, Syria, Turkey, Turkmenistan, United Arab Emirates, Yemen)



MRG	Manufactured Rubber Goods (not tire)
MT	Metric Tonne
MTpa	Metric Tonne per Annum
MM\$	Millions of United States Dollars
MMM\$	Billions of United States Dollars
MWhr	Megawatt hour
NOx	Nitrous Oxides
N. America	Canada, USA and Mexico
N. Asia	Countries around mainland Asia: (Bangladesh, Bhutan, Cambodia, Japan, Laos, Mongolia, Myanmar, Nepal, North Korea, South Korea, Taiwan, Thailand, Vietnam)
OTR	Off road tire
pa	Per annum
Parc	A regional or country pool of cars in service
PAH	Polycyclic aromatic hydrocarbons
PC	Passenger car tire
Pckg	Packaging segment
PM	Particulate Matter
RCCL	Rubber Chemical Consultants Ltd
SGA	Cost of sales and general administration
SOx	Sulphurous Oxides
Specialist	Applications not covered by tire, MRG & plastics
SUV	Sport Utility Vehicle or Suburban Utility Vehicle
S. America	Central and South American Continent
S. Asia	Countries Separate from mainland Asia: (Australia, Brunei, East Timor, Fiji Islands, Indonesia, Malaysia, New Zealand, Philippines, Samoa Islands, Singapore, Solomon Islands, Sri Lanka, Tonga, Vanuatu)
TPE	Thermoplastic Elastomer
TPV	Thermoplastic Vulcanisate
TPU	Thermoplastic Urethane
Trans	Transport industrial segment, covering mass transit and non-automotive segments
TR	Truck Tire
USD	United States Dollars
YoY	Year on year



3.2 SCOPE

Furnace Carbon Black

The report covers furnace carbon black manufacturers and markets. It should be noted that there are several specific minor variants of 'carbon black' produced by other manufacturing methods which are not covered by this report. Please refer to the **Appendices Section 13.2** for the definition of furnace carbon black and a brief summary of other carbon black varieties.

Markets

The report covers major furnace carbon black markets in detail, these being Tire, Rubber Goods (MRG) and Plastics. Minor markets are combined into an 'Other' category in order to provide a concise report. The 'Other' market category includes inks, coatings and specialist applications. For a detailed view on the market breakdowns used in volume and value analysis please refer to the **Appendices - Section 13.1**.

Geographies

The report covers the major furnace carbon black markets in detail, these being Tire, Rubber Goods (MRG) and plastics. Minor markets are combined into an 'Other' category in order to provide a concise report. The 'Other' market category includes inks, coatings and niche application areas. For a more detailed view on the market breakdowns used in volume and value analysis please refer to **Table 3.1**.

Time Frame

This report covers the period 2011 to 2030.

Market Volumes

Market volumes for 2011 to 2017 are determined from historic figures, volumes for 2018 to 2030 are projected using stated modelling techniques. Details can be found in **Section 4**.

Market Values

Market values for 2016 and 2017, projected values use unadjusted 2017 values and projected volumes.

3.3 OBJECTIVES

The key report objectives are as follows:

- Provide an overview of the furnace carbon industry, manufacturers and changes.
- Analyse current and future manufacturing trends and technologies.
- Provide market insight for the primary furnace carbon black markets.
- Analyse carbon black manufacturer costs and selling prices.
- Analyse trends in international trade.
- Discuss market values, modelled values and international trade values.
- Estimate market volumes for furnace carbon black.
- Estimate market values for furnace carbon black.
- Determine industry utilisation rates.



3.4 INFORMATION SOURCES

Primary Sources

Tire & rubber chemical company confidential contacts covering a broad range of disciplines (e.g. technical, commercial, marketing, production).

Knowledge gained via industry participation – no confidential information is presented.

Consultation for a range of clients on market and technical issues, enables extensive industry interaction and ensures up to date knowledge. Active consultations include carbon black companies, tire companies, rubber chemical companies, petrochemical companies, investment institutions and technology start-ups. While confidential information is not used directly in reports, information is used to benchmark and fine tune the reporting system (GTRCDB©). This provides realistic volume estimates via real life volume and technology benchmarking.

Secondary Sources

Company annual reports & news feeds.

Industry journals.

Industry association journals and websites.

Industry conferences and papers.

Company web sites.

Government websites.

Patent reviews.

Global Tire & Rubber Chemicals Database (GTRCDB©)

The GTRCDB© is a proprietary database and reporting system designed specifically to gather and process market information for companies active in material compounding. This database is constantly fed information relating to tire, rubber and plastics compounding activities. Bespoke reporting tools allow flexible reporting of past, present and future market requirements for individual compounding ingredients. This is complimented by an extensive repository of chemical manufacturer information.

3.5 ASSUMPTIONS

RCCL tries wherever possible to rely on fact based analysis. Much of the underlying analysis via the GTRCDB© uses factual information gathered over many years from reliable sources. In order to provide a full market picture of a complex segment it is always necessary to make assumptions. **Wherever possible RCCL will make these clear by making a comment in bold red.** This type of annotation will be present in the methodology section (**Section 4**) as well as within the market volume (**Section 9**) and values (**Section 10**) sections.

RCCL's centrally controlled market analysis system allows alternative scenarios to be run. Clients wishing to adjust any of the stated assumptions can arrange for further analysis at an additional agreed fee.

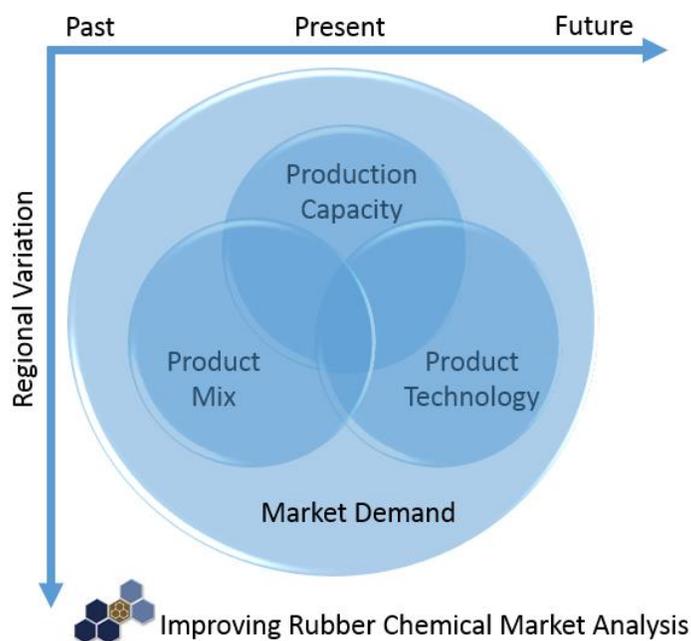
4 METHODOLOGY

This section explains the principles behind the generation of rubber chemical market volumes. **Section 4.1** introduces a high level view of the ‘consumer-up’ approach. **Section 4.2** discusses the framework for the ‘consumer-up’ approach.

4.1 GENERAL REPORTING PRINCIPLES

A key concept of the methodology used is that of consumer driven demand using ‘Consumer Up’ analysis. A high level view of the approach is presented in **Figure 4.1**. This shows that in order to evaluate the market an understanding of product mix, product technology and production capacity is required. Further to this, it is also necessary to adjust production capacity for market demand. All of these aforementioned factors are bound by time and geography. Time in this case represents shifting product mixes, market demands and associated production capacities, whereas geography represents additional regional constraints/opportunities related to legislation and megatrends.

Figure 4.1 – ‘Consumer-Up’ Market Analysis



4.2 CONSUMER-UP ANALYSIS (MARKET VOLUMES)

RCCL’s ‘Consumer up’ methodology is based upon analysis of individual rubber chemical consumers at the plant level. Each plant is allocated to a region, country and optionally to a state or province. Analysis is then done by iterating over each plant for each of the required years. This plant level analysis is coupled with market driven product and technology changes which allows a significantly more granular reporting approach versus other market volume assessment methods.

This is explained in more detail in the following sections.

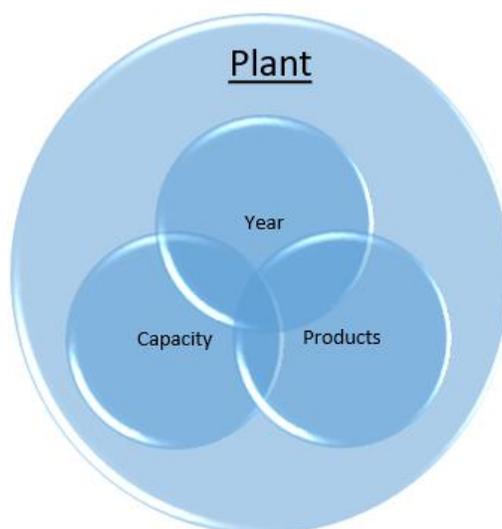
4.2.1 Key Parameters

RCCL has determined all the key parameters (these parameters can also be considered as variables) associated with a robust and meaningful analysis of the rubber chemical market. The reporting system is built to reflect 'real-life' usage based upon individual production plant output. This output can be broken down into product constructions with associated components and compound formulations.

4.2.2 Consumer Plant Parameters

Parameters related to consumer plants are highlighted in **Figure 4.2**.

Figure 4.2 - Consumer Plant Parameters



The following information is regularly updated for each consumer plant from a range of different industry sources:

Yearly production capacity at the plant level.

Yearly product splits at the plant level.

Intelligence information relating to future production and product developments.

Changes in ownership or transfer of assets

4.2.3 Product Technology Parameters

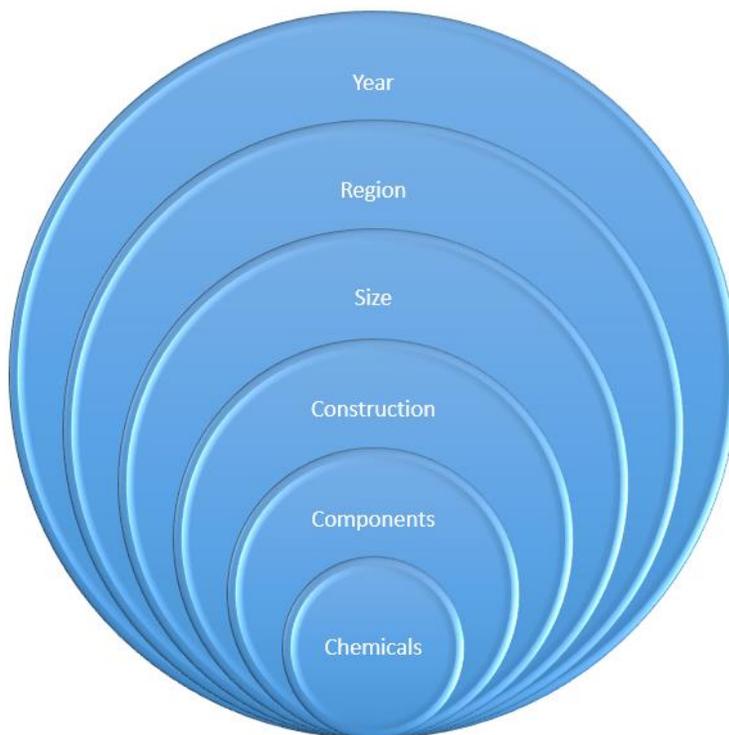
Parameters related to products are highlighted in **Figure 4.3**. Product technology parameters are dependent upon time as well as region. Time dependency is evident especially in shifting sizes and underlying compound formulations (chemicals). Regional dependency is evident in both shifting sizes as well as compositions, with increased sensitivity to chemical composition on a regional basis due to a number of differing drivers.

The following product information is regularly updated and applied to the appropriate consumers based on a range of industry sources:

Yearly product technology changes (construction based).

- Yearly product compound changes (material based).
- Introduction of differentiated product sub-categories.
- Regional product shifts (e.g. tire sizes in each sub category)

Figure 4.3 - Product Technology Parameters



4.2.4 Market Parameters

Top level parameters relating to market demands are presented in **Figure 4.4**. These market parameters are used to create a range of possibilities for future market volume outlooks via the use of incremental changes to product split and technologies. When potentially disruptive drivers are considered (e.g. potential legislation changes) the analysis can vary demands based on predicted splits versus publically stated developments.

The following market information is regularly updated and applied to generate the appropriate utilisation rates based on maximum production capacities:

- Past, present and future product unit production.
- Economic indicators & drivers, industry specific and IMF based regional and country forecasts.
- Tire company market assessments.
- Industry market assessments from a range of different sources.
- Upcoming regional legislative drivers.

Regional influences on specific sub segments.

Individual consumer responses to market changes and requirements.

Figure 4.4 - Market Utilisation Parameters



4.2.4.1 Historic Values

The RCCL reporting system uses market models to adjust the manufacturing capacities to actual market volumes. Historic values include values from the start year (2011) to the last completed full year (LFY). These values utilise the market model plus a manual adjustment to bring regional figures in line with those found from research.

Specific tire sub-segment markets are better defined than others. For tire industry data, historic figures are adjusted to give overall regional balances for truck, light truck, SUV and PC tires. This is done by adjusting regions with well-defined tire production and/or market data first and then applying necessary adjustments to the remaining regions. Currently this means that North America, Europe, North Asia and India are adjusted first and the remaining regions are adjusted to give a global figure in agreement with research.

For rubber goods overall market demand is not typically well documented, this means that the market model is applied from the start year (2011) with manual adjustments being made for specific sub-segment changes. Examples of specific changes relate to the mining and energy industries where performance may not track GDP values.

4.2.4.2 Future Projections

Reporting years after the LFY can be projected in various ways, as shown in **Table 4.1**. The two most common projections (PI and PIII) are highlighted in bold.



Projection I gives an upper bound to market volumes based on the theoretical maximum production capacities.

Projection III gives the most probable market volume based on the LFY capacity adjusted by forward market models as well as changing actual product splits. Actual splits are either reported plant product splits or those estimated by RCCL.

Table 4.1 - Future Year Projections

Type	Description
I	Demand based on total production capacity and actual splits for all years.
II	Actual demand to LFY. LFY projected by market model utilisation.
III	Actual demand to LFY. LFY projected by market model utilisation and YoY actual product splits.
IV	Actual demand to LFY. LFY projected by market model utilisation and YoY predicted product splits.
V	Actual demand to LFY. LFY capacity and utilisation fixed using actual product splits.
VI	Actual demand to LFY. LFY capacity and utilisation fixed using predicted product splits.

4.3 MARKET VALUE ANALYSIS

Value analysis is based upon a combination of proprietary market price modelling (see **Section 8.2**), confidential RCCL sources and international trade data. Average segmental regional market prices are combined to provide a weighted average, these are totaled for final global values. Country level weighted values utilise the parent regional segment market prices and individual country and state level segment splits.

Note: Market values are based on average final delivered prices.

4.4 DATA VALIDATION

This section addresses the issue of data validation.

4.4.1 Market Volumes

Market volume data is determined following the principles set out earlier in this section. Underlying compound formulations for tires, rubber goods, plastics and 'other' are adjusted by region and sub category. In the case of tires and rubber goods additional proprietary segment specific modelling is used. Formulations have been developed from 2009 onwards from a wide range of sources and have been validated for different groups of rubber chemicals (e.g. carbon black, precipitated silica, process oils etc.). Furnace carbon black was one of the first rubber chemicals fully modelled and benefits from the full history and accumulated knowledge in **GTRCDB®**.

Validation is made versus real life usage data from tire, rubber goods and plastic compound manufacturers (from confidential RCCL sources). Additional validation is done using published and



confidential carbon black manufacturers information which gives a fully independent cross check of both market volume and market value.

4.4.2 Market Values

Delivered prices were obtained from confidential sources. Total market value was validated against an independently calculated value derived from manufacturer financial data, company presentations and confidential RCCL sources.

5 FURNACE CARBON BLACK INDUSTRY OVERVIEW

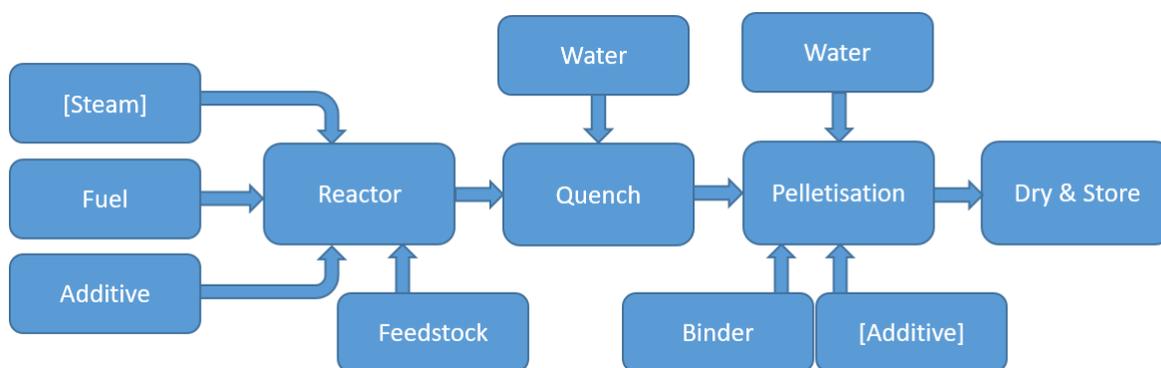
This section provides an overview of the furnace carbon black industry serving as an introduction to topics covered in more detail in later sections. **Section 5.1** focuses on the raw material inputs followed by process discussion in **Section 5.2**. The manufacturing landscape is covered in **Section 5.3** with coverage of the key market segments in **Section 5.4**.

Readers not familiar with the furnace carbon black process should refer to the **Appendices - Section 13.2** prior to reading this section.

5.1 RAW MATERIALS

Figure 5.1 provides a schematic of raw material usage in the carbon black furnace process, feedstock and fuel account for around 98% of the total variable cost, there are several other important raw materials used in the process (depending upon grade). A source of alkali metal is required as the structure control additive in the process, this is typically potassium carbonate, although other potassium sources can be used. This additive is used at ppm levels (relative to the feedstock) and is fed into the reactor as a weak solution either alongside the fuel or the feedstock. A binder is typically required to aid in the production of carbon black pellets, these binders are typically by products from the paper industry, lignin based products being the most common. Binders are typically used at concentrations of around 0.5% relative to the carbon black. Substantial quantities of water are also used at various stages to quench (stop) the reaction, to control the temperature of the product stream prior to the bag filters and to enable the pelletisation of the product. For carcass grades steam can also be used to atomise the feedstock in the reactor.

Figure 5.1 - Raw Material Usage Overview



Furnace carbon black is made from heavy residual oils (termed carbon black feedstock) which are by-products of the oil and coking industries. Three broad categories cover this:

- Catalytic Cracker Residues (FCC fluid cat cracker)



End of sample report.

Full report

177 pages

88 Figures

139 Tables

+ Excel Workbook

If you have any questions
please contact us.

(Please also refer to full table of
contents in separate document)

5.2 MANUFACTURING PROCESS

Readers not familiar with the furnace carbon black process should refer to the **Appendices - Section 13.2**. It will be useful to have a basic understanding of the process prior to reading **Section 6.4** which covers manufacturing cost analysis and **Section 6.5** which covers manufacturing developments.