Sugar has been an essential part of the brewing and distilling industries for many years. The basic process of sugar being fermented into alcohol and carbon dioxide has been understood for centuries and starch as a source of these sugars has been supplied by grain merchants and maltsters alike. In the form of apples (for cider and calvados), sugar cane (molasses for rum), grapes (wines and brandy) and even honey (mead and honey liqueurs) this supply of sugar for brewing and distilling has been less overt.

Brewing sugars
Since 1564 there have been sugar refineries in London, many of them supplying sugar as an adjunct to the breweries at that time. In 1876 there were 300 companies making brewing sugars and many brewers had their own refineries. Since then, however, the industry has contracted. In the 1980s glucose syrup became readily available in a number of forms; this accelerated in the 1990s – and the sugar industry, as a supplier to the brewing industry, has not recovered. Since 1976 there have been three refiners left in the UK: British Sugar, Tate and Lyle – and Ragus.

Ragus, an independent, family-owned company, was formed in 1928 and is the oldest British sugar supplier. Its history dates back to 1880 when brothers John, Samuel and Charles Eastick began a sugar analysis and consulting practice in the centre of London. Two years later, and impressed by their ground-breaking work, Abram Lyle invited the Eastick brothers to set up a laboratory at his new Plaistow Wharf refinery in east London. Initially, the analysis of raw sugar was established for the purpose of levying price and duty payments. However, in 1883 tough times importing cargoes of sugar brought production to a near-halt. Charles had begun to experiment with the by-products of the sugar refining process and Golden Syrup, the world’s oldest branded product, was born. Under the leadership of his brother, John formulated the special methods of making brewers’ saccharum (sugar), inverted sugar and Golden Syrup.

At the end of the decade, the Eastick brothers left the Lyle plant. John travelled to Australia to run a sugar refinery in Melbourne (and subsequently Bundaberg, Queensland) and Charles went to run London’s

Sweet taste of success
Steve Curtis visits Ragus Sugars

Sugar has had a lot of bad press in recent years; refined sugars in our diets are apparently the cause of obesity and heart disease, it is claimed that sugar in soft drinks rots away our teeth – and is apparently ‘toxic’ and the cause of the rise in diabetes in the developed world. Yet sugar is a naturally occurring substance – and fruits, milk and honey have been part of the human diet since our early evolution. So as part of a healthy lifestyle and a balanced diet, its consumption is not necessarily the ‘evil’ it has been described as by some of the anti-sugar lobby.

Ragus Sugars Manufacturing Ltd.
Tel. +44 (0)1753 575353
sales@ragus.com.uk
www.ragus.co.uk
second largest sugar refinery, Martineaus in Whitechapel. During the First World War Charles assumed a national role administering the UK’s wartime sugar rationing quotas, for which he was awarded an MBE for services to his country. On John’s return from Australia, he and Charles continued their analysis and consulting of sugar through the Newland Brothers practice in Dunstan Hill (inherited from John’s father-in-law) and together with their brother Samuel had formulated 11 sugar refining related patents by 1919.

During the 1920s small amounts of specialised sugars were being imported into Britain as it was not economic for the UK’s larger refineries to manufacture these. Charles seized on this opportunity and began the manufacture brewers’ saccharum, inverted sugar and Golden Syrup for brewers, bakers and confectioners, leading to the establishment of a specialist factory, Ragus Sugars, on the new Slough trading estate in west London. In 1930 Charles merged the factory with another of his companies to produce inverted sugars: a sweeter, moist sugar perfect for baking. Charles’ youngest son Douglas took over the running of the Ragus operation, but when he joined the RAF during the Second World War, Charles came out of retirement to manage the business. He died two years after the end of the war and in the 1950s Ragus passed to Charles’ youngest grandsons Ronald and Barry. In the 1970s, the company had increased the output of refined white and raw sugar to the extent that the workforce almost doubled.

Global operation
In 1990 Ronald and Barry retired and the great grandsons of Charles Eastick, brothers James and Benjamin and their cousin Peter, continued their great grandfather’s hard work. Peter and James have developed today’s Ragus from a UK-based refinery into a full-service global operation. Their new, recently-opened multi-million pound state-of-the-art factory supplies hundreds of tonnes of pure sugar products to customers all over the world every day.

The production and use of brewing sugar has declined over the last few years. At the moment, and including sugar for the cider industry, it accounts for only about 6% of the Ragus turnover. Back in the 70s and 80s supply to the brewing industry accounted for 25% of turnover. Brew blocks, the once-popular invert sugar made for the industry, now account for about 2% of turnover.

Even with the rise of craft brewing and the hundreds of new breweries opening every year, there has not been a significant increase in the supply to brewers. Ben Eastick, the host for my visit to the new refining facility on a new site in the outskirts of Slough, says that there has been enthusiasm from this new breed of brewer but with no experience of buying brewing sugar this enthusiasm hasn’t been seen in sales. Ben points out that brewing sugar can be used for expansion of a brewhouse-restricted brewery, with increased Wort gravity and longer brewlength without capital investment, but this needs education. “Perhaps the phone will start ringing, but it hasn’t really affected the business!”

Brewing sugars are currently supplied through bakery wholesalers as Ragus cannot service all of the brewers directly. A small amount goes through Murphy and Sons. Ragus is a lean operation; to employ an individual to target the brewing industry specifically, and to run a brewing division, would cost a lot of money and would need a lot of business to get a return. Brewer Harveys of Lewes is supplied directly from Slough, others through the baking business distribution. Other brewers using Ragus brewing sugars include the Wychwood/Brakspear Brewery in Witney, Oxfordshire, Timothy Taylor in Keighley, Jennings of Cockermouth and the Lodden Brewery in Berkshire. “Beer should be refreshing,” says Ben of the mainly ‘heritage’ beers that are still brewed using Ragus products, “Some of the best beers in the country use our sugars.”

Invert sugars
Sugar is the common name for sweet, short-chain, soluble carbohydrates. They are composed of carbon, hydrogen, and oxygen. There are various types of sugar derived from different sources – simple sugars are monosaccharides and include glucose (also known as dextrose), fructose and galactose. Table or granulated sugar is normally sucrose (sucrose being another word for cane sugar or beet sugar) and is a disaccharide combination of the monosaccharides glucose and fructose with the formula C₁₂H₂₂O₁₁. Other disaccharides include maltose (glucose and glucose – malt sugar) and lactose (galactose and glucose – milk sugar).

Sugar’s maximum concentration in water is 67%. To go further you must break it down to invert sugar. Invert sugars are created by hydrolysing sucrose into fructose and glucose by heating a solution of sucrose and applying acid or enzymes, so making the solution acidic (target pH value of 1.6). When the desired level of inversion (the ratio of sucrose to glucose/fructose) is achieved, Ragus neutralises the syrup with sodium carbonate. Invert sugar has a lower water activity than sucrose, so inverts have greater preserving qualities (giving shelf-life) and reduced crystallisation. ‘Partial invert’ contains 44% sucrose and 56% invert, and has a sweetness value

Saccharum is a genus of tall perennial plants of the broomedge tribe within the grass family. The genus is widespread across tropical, subtropical, and warm temperate regions in Africa, Eurasia, Australia, the Americas, and assorted oceanic islands. Several species are cultivated and naturalised in areas outside their native habitats. Saccharum includes the sugarcanes, as well as several ornamental grasses such as Ravenna grass. They have stout, jointed, fibrous stalks that are generally rich in sugar, and measure two to six metres tall. All sugar cane species interbreed and the major commercial cultivars are complex hybrids.
Benefits of inverted sugar:

1. Reduced crystallisation
2. Higher concentration and more stable – Golden Syrup is 83-84% sugar, with an eighteen month shelf life.
3. It is 20 to 40% sweeter than sucrose alone – so use less to get same sweetness
4. Sucrose needs breaking down by yeast to ferment, so invert is more readily fermentable
5. Readily available to make colour, flavour and texture

Sucrose

\[
\begin{align*}
\text{HO} & \quad \text{OH} & \quad \text{OH} & \quad \text{OH} & \quad \text{OH} & \quad \text{OH} & \quad \text{OH} \\
\text{H}_2\text{C} & \quad \text{O} & \quad \text{O} & \quad \text{O} & \quad \text{OH} & \quad \text{OH} & \quad \text{H}_2\text{O} \\
\end{align*}
\]

Glucose + Fructose

\[
\begin{align*}
\text{HO} & \quad \text{OH} & \quad \text{OH} & \quad \text{OH} & \quad \text{OH} & \quad \text{OH} & \quad \text{OH} \\
\text{H}_2\text{C} & \quad \text{O} & \quad \text{O} & \quad \text{O} & \quad \text{OH} & \quad \text{OH} & \quad \text{H}_2\text{O} \\
\end{align*}
\]

Ragus brewing sugars

The Ragus range of brewing sugars are produced from raw cane and demerara sugars, with colours ranging from light brown amber to dark brown, and with flavours ranging from mellow to robust treacle. They are fully inverted products; in liquid form they consist of 95% invert and 5% sucrose, while in crystalline block form they contain 75% invert, 5% sucrose and 20% wheat-derived glucose. They are all 95% readily fermentable (and 5% non-fermentable) and with extract values of between 321.5 and 326.5 L°/Kg; lighter-coloured types are used in brewing lager and pale ale, medium-coloured in bitter and strong ale, and darker ones in mild ale, stouts and porters.

Overuse of sugar, or using a mash with high levels of maltose, will produce thin beer. Adding glucose in the form of a brublock (note 100% glucose (no “sugar”) blocks are not called brewblocks, but spelt with a “u”) can impart body and a nutty flavour. The higher the concentration of unfermented glucose, the fruitier the beer will taste. When fermentation is complete, additional ‘priming’ sugar can be added to start secondary fermentation and increase flavour.

During the last 20 years, Ragus has for been the only block sugar supplier to the brewing industry. It has a continued commitment to keep supplying, despite not really being economically viable and Ben suggests that they represent a strong part of the company’s heritage.

Brewer’s Sugar No.1: This can be produced as a fully inverted (glucose-fructose mixture) syrup or seeded into a crystalline block. It’s 95% readily fermentable, with a subtle colour (25-35 EBC) and mellow flavour. It’s used in brewing lager and pale ale.

Brewer’s Sugar No.2: This can be produced as a fully inverted (glucose-fructose mixture) syrup or seeded into a crystalline block. It’s 95% readily fermentable, with an amber colour (60-70 EBC) and strong flavour. It’s used in bitter and strong ale.

Brewer’s Sugar No.3: This can be produced as a fully inverted (glucose-fructose mixture) syrup or seeded into a crystalline block. It’s 95% readily fermentable, with a dark brown colour (120-140 EBC) and rich flavour. It’s used in mild ale, stouts and porters.
Also available is Brewer’s Sugar No.4, a fully inverted syrup or crystalline block with a darker colour (550 – 650 EBC for the block, 625- 724 EBC for the syrup) derived from caramel rather than the dark cane sugars in Nos. 1 to 3.

The Ragus Brublock range are crystalline blocks containing 75% glucose and coloured with cane molasses (No.1 and 2) and caramel (No.3). They give the same extract values (321.5 to 326.5 L°/Kg) as the invert brewing sugars, but are less fermentable at 80% readily fermentable, 4% slowly fermentable and a maximum 16% unfermentable sugars.

Other brewing sugars products available are Dark Brewing Syrup (an invert syrup at 2875 – 3375 EBC), Brewers Candy Block, and an convenient Glucose Chip Block at 80% readily fermentable sugar. The company also supplies priming sugar in 25t bulk tankers for brewers with cask racking operations – and an organic brewing syrup is also available.

Ragus is also selling into the growing cider industry, with some makers preferring liquid sugars to glucose syrups. The variable sugar in apples (up to 65% fructose, plus glucose and sucrose) due to different ripeness levels, are more stable and have greater mouthfeel if liquid sugars are used as a sugar top-up.

Sourcing of sugars
Ragus uses cane sugar for its range of brewing sugars, with dark cane sugars and molasses being preferred for their ability to produce colour. Beet sugar has limitations and is generally considered to be inferior to sugar cane. Brewers No.1 could possibly be made from beet, but Nos 2 to 4 need cane to produce colour without any danger of any associated beet (or turnip) notes.

Ben explains that Ragus cane sugars are selected for their abilities to make brewing and baking sugars: "We source the best raw materials, go out to the cane sugar mills and work directly with them.” Cane sugar is sourced mainly from the ACP (Africa Caribbean Pacific) producers such as Mauritius, Malawi, Guadeloupe, Mozambique and Swaziland, with some also coming from India. Ragus also purchases beet sugar from the EU, largely supplied to the confectionery industry and cheaper products, but: "We don’t give brewers the beet option ... for many reasons!"

The company is now not really involved in sugar research and development, choosing not to ‘confuse’ customers with what it does. Other sugar refiners have gone onto artificial sweeteners and diverged into other industries such as Bioethanol. Ragus works with sugar mills looking to improve agronomy, water usage and sustainability, working with the Bonsucro group - a global not-for-profit, multi-stakeholder organisation fostering the sustainability of the sugarcane sector through its certification scheme and its support for continuous improvement for members. Distiller Bacardi, for example, hopes to be using 100% Bonsucro-certified sugarcane by 2020.

Sugar market
Ragus products are exported all over the world, with the notable exception of the USA, and more and more into EU markets. The business had a turnover of £23m for the last financial year. Its new factory opened three years ago, with extra refining capacity planned for a 5% year-on-year growth. This year (2015) is expected to be 10% up on last year, with 31,000 tonnes of output. Current capacity is just short of 50,000 tonnes. Ragus is seeing growth in both its confectionery and bakery businesses. Baking is 75% of its output, with a ratio of 70:30 syrup:crystalline products. In the UK Ragus has only 1.5% of total sugar market, but 35% of the specialist sugars.

Tate and Lyle is now part of the ASR Group, a global group of sugar companies with brands and operations around the world. Their Thames Refinery at Silvertown produces around 650,000 tonnes of white sugar from sugarcane and is the largest sugar refinery in the EU and one of the largest in the world with a capacity of 1.2million tonnes per annum.

British Sugar, now part of the global AB Sugar Group, produces over one million tonnes of sugar in the UK and an additional 500,000 tonnes of
All change in 2017

The sugar market is going through a period of change in the run-up to the 2017 sugar reforms, as the EU prepares to abolish sugar beet production quotas, end export limits (currently 1.5 million tonnes) and eliminate the guaranteed price offered to sugar beet farmers. The quota management system will end on 30 September 2017, from when sugar companies can essentially produce as much sugar as they want. According to Ben Eastick, before the original quota systems were introduced almost five decades ago, the EU was one of the biggest sugar suppliers into the world market – and with the 2017 reforms, the EU will gradually become a major supplier again.

There are now just two white-sugar refineries in the UK. Ben explains there has been, and will continue to be, a jostling of the EU sugar market up until the 2017 reforms. He says: “There is a contraction within the sugar market in terms of suppliers. Various takeovers are going on and that is the big players in the industry lining themselves up. It is essentially survival of the fittest.”

The most recent change in the food market has been the sale of UK sugar distributor Napier Brown to French firm Tereos in May this year. In a statement about the sale, Tereos claimed that: “The transaction will significantly reinforce Tereos’ position in the UK, which is a strategic market for French producers.” This is, as Ben Eastick explains, the sugar producers trying to capture market share in the lead-up to 2017.

“High stocks and weak demand continue to dominate the global sugar markets. In May traded prices in both London and New York reached six-year lows, partly as a result of Thailand’s large surplus of raw sugar, although the general consensus is that the market price later in the year will slowly start to increase. As of 2017, the UK and EU sugar industry may want to reduce its EU supply as they will be able to export refined sugar on the world market, if offered a more favourable price. This, in turn, will lead to prices being much less stable as it will be a potentially volatile market, which will vary with world market prices and supply (or stocks). EU sugar imports are capped at 3.5 million tonnes and, post-2017, this will probably drop to around 0.5mt. Nobody knows what will actually happen, so it’s difficult to say how much sugar prices will rise in value terms, but sugar is currently being traded at ridiculously low pricing, which is unsustainable.”

“The world is very small and it’s a global market. What is happening in the world will affect the price you pay for sugar – not six but twelve months down the line, as it will impact on EU and UK markets.”

animal feed from sugar beet pulp.
The company processes the whole UK sugar beet crop in its four beet factories. In 2006 AB Sugar acquired 51% of Illovo Sugar Limited, the largest cane sugar producer in Africa and one of the world’s lowest cost producers. Their recently modified British Sugar plants can now refine sugarcane as well as beet.
The sugar market is currently dumping surplus beet sugar at artificially low prices and the EU imposes a €419m/t tariff on imported cane sugar. Sugar beet production in 2015 is expected to be down 25% over last year due to an oversupply in the market. All this will change from 2017 when the new EU sugar regime comes into effect.

New factory
The new Ragus factory is much more efficient than the old plant which had only a 25,000 tonne capacity, but to reach the 50,000 tonne output level it will need to add a night shift. Currently, it produces 31,000 tonnes on two shifts, not including weekends. There are no plans to step up to night shifts in their five-year plan until post-2017, unless of course there is a big shift in the market.
The factory was a ‘multi-million’ pound construction of 35,240 ft² with 16 syrup holding tanks and nine inversion pans. Musk Engineering was chosen to provide a complete turnkey service of the new green field site development. Musk’s scope of supply included the design, offsite manufacture, installation and commissioning of:
• Stainless steel platforms and mezzanine levels
• Automated control system using Siemens S7 hardware
• Relocation and integration of existing equipment
• Services from source [steam, water, hot water generation, compressed air]
• Electrical services fit out (lighting and power)

Musk was also responsible for the complete process design and CDM management (as Principal Contractor) during the fit-out installation period.
The factory produces brewing sugars in both crystalline and syrup form, with a range of fermentabilities from 45 to 95% and colours from 25° to 900°EBC. The factory produces 350 products – all of which are sugars. Daily production is on a batch basis.

Production
Ben and I are joined by Factory Manager Mel Boyle on our tour of the impressive facilities. Ragus sources its sugars from certified supplier mills and refineries all over the world. The sugar arrives in thousand-kilo bags inside metal cargo containers, which are taken directly from the ships to the factory and stored in the state-of-the-art warehouse. The on-site sugar storage capacity is 1,100 tonnes.
The sugar crystals are dissolved in large inversion pans by heating the sucrose solution to over 70°C. There are five inversion pans of 2.7 tonnes each, two at 1.5 tonnes, one at 1 tonne and a small tank of just 200kg. These are heated by jackets of circulating hot water.
When the solution reaches a sugar content of 66%, it can be called liquid sugar. This can then be inverted by applying a solution of acid (or enzymes), making the syrup acidic with a pH value of 1.6. When the desired ratio of sucrose to glucose/fructose is achieved to a polarisation of -20, the syrup is neutralised with sodium carbonate, bringing
its pH value to between 5.0 and 6.0. The syrup is now fully inverted (95% invert sugar and 5% sucrose) and can be kept in this state or have more sucrose added to produce a Partial Invert Syrup (44% sucrose:56% invert). Continued heating produces colour through caramelisation – the laboratory will carefully check batches for pH, brix and colour before cooling by circulating cold water. Kieselguhr powder is added to the syrup tank, and the syrup is filtered through a Carlson plate and frame filter. The plant is all controlled via Siemens PLCs, with the operator inputting the original recipe and the laboratory technician adding the parameters for brix, colour and pH.

The invert syrup is then passed through a 40-micron filter to remove any unwanted gums, waxes, minerals or metal that might have been attached to the sugar crystal. From here the syrup can go either to be blended for soft crystalline sugar production or pumped to the maturation/holding tanks in the pump room. When ready the syrup will be decanted through 80-micron filters, and packed into containers ranging in size from 7-kilo to 25,000-kilo road tankers and sent to customers around the world.

**Pump room**

The pump room contains 11 tanks of syrup storage, holding a total of 330 tonnes of stock syrups. These feed four ‘flowtronix’ liquid filling machines, with packages being filled on weighing scales. Blocks of brewing sugars are ‘seeded’ by adding dextrose crystals to the syrup in the inversion pans, cooled to < 40°C to allow seeding (pans are cooled using circulation cold water) then pumped/filled into boxes. Mel suggests that this is the point of no return in producing a solid crystalline product, “Once the seeding process has started, you’re committed to it.”

Plant CIP is with hot water – no detergents are needed – but the outside of vessels and the working environment are kept clean with foaming detergents. The factory, from the offices to laboratory to process area, is scrupulously clean – as befits a food-producing facility.

**Dry goods**

Ragus also process dry crystalline sugars, with grading, dust removal and metal detection at 20 ton per day capacity. A flat bed dryer - hot air flows up through perforated sheet and through a fluid bed of crystalline sugar – followed by a screening, sieving and bagging operation. A separate sugar blending operation producing a range of white sugar and/or raw/coloured sugar blends. To manufacture soft sugars Ragus send the raw sugar to a blender after sieving and metal detection; the raw sugar is mixed with refiner’s syrup to coat the crystals with an adhering film. The plant has a capacity of 6 – 7 tonnes per day of constant colour or soft brown sugars.

**People**

The site has 45 employees and the business is run jointly by the three directors. Peter Eastick is responsible for buying melt sugars and runs the day-to-day production operations. James Eastick buys molasses and glucose syrups, and is responsible for sales operations. Ben buys bespoke and ethical sugars as well as running the marketing of Ragus.

Ben has been involved in brewing since he left school. With experience as a wine and spirits buyer as well as two and a half years at Brakspears Brewery in Henley – he spent his time as a brewing operator, scrubbing coppers for six months as a ‘copper sidesman’ and then number two to the second brewer. Known locally as ‘Ben the Brewer’ it took a serious back injury to force him to leave the brewery and join the family company, where he spent two and a half years in the laboratory before joining the sales operation.

Thanks are due to Ben, Peter and the team at Ragus Sugars for their time and enthusiasm in showing me around their fantastic facility and telling me the story of their past, present and future. Perhaps sometime soon brewing sugars will be seen as something innovative which give a point of difference as well as introducing aspects of heritage from the past. To learn more about sugar and sugar refining, the Ragus website is a wonderful resource and is both educational and entertaining. And for those readers who have got to the end of this article without recognising the origin of the company name, perhaps they should look closely at inverting **sugar**.