

FRUIT PROCESSING



www.fruit-processing.com

Business News

Events

Market Price Report

Process Technology

Supplying Market

MAY
5/2017

INTERNATIONAL JOURNAL FOR THE FRUIT PROCESSING, JUICE AND SOFT DRINKS PRODUCING INDUSTRY



Back to Nature – The Fruit Juice Revolution

read more on p.164



drinktec
Go with the flow.



Don't miss the preview in

FLÜSSIGES OBST & **FRUIT PROCESSING**

FRUIT PROCESSING 7/2017 and **FLÜSSIGES OBST 8/2017** feature a preview of **drinktec 2017**. These issues will have a high circulation and be distributed at the exhibition.

Our special offer: „five to one“

10% combination discount for advertising in both magazines.

1

Invite visitors to your booth through an **advertisement**.

Advertising closes on **July 5, 2017 (FRUIT PROCESSING)** or **July 21, 2017 (FLÜSSIGES OBST)**

2

Provide information about exponents and innovations in your

drinktec preview with publication guarantee. (detailed information see below)

3

Additional distribution of the magazines at drinktec 2017.

4

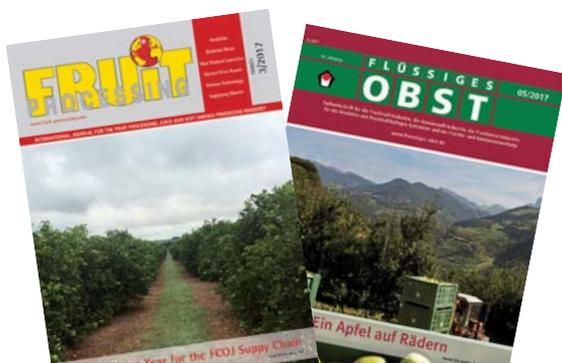
Free banner (120 x 60 Pixel) on www.fruit-processing.com / www.fluessiges-obst.de from July 1 until September 15, 2017.

5

Additionally your advertisement and press release will be published in the **online issue**.

Please send your **press release** (at most 2,000 characters) incl. booth no. by the latest **July 5, 2017** to editorial@fruit-processing.com.

drinktec is recognized as the No. 1 platform for innovations and new developments in the beverage and liquid food sector. It is a Who's Who of the industry, the place where the future is mapped out. FRUIT PROCESSING & FLÜSSIGES OBST keep you up-to-date!



Save the advertising closing dates in July!

Your contact:



Cornelia Hebbe
phone: +49 (0) 2634 9235 16
cornelia.hebbe@confructa-medien.com

I will be pleased to submit an individual offer.

EDITORIAL

Dear Readers,

The 'Veggie' fashion has strongly arrived to the juice market in order to fulfill the low sugar content beverages demand. The juice industry faces a new scenario and there are still many gaps to cover at production level. New product developers around the world are waiting for new processing solutions to support their innovative recipes. One of these new processing technologies is cold extraction. Please find out more on page 154 ff.

Where to expect food and juice markets growth in the world? Marcos Fava Neves and Vinicius Gustavo Trombin have observed 12 factors to identify booming food markets in the coming years. On page 159 ff they contribute a model to understand the variables to help building marketing intelligence systems.

In order to be able to meet demand despite natural fluctuations in the raw material and varying requirements for different consumer products, apple juice producers are using mash enzymes to optimize the juice yield and increase processing capacity. Please read more how new mash enzymes save time and increase apple juice yields on page 161 ff.

The fruit juice segment is regarded as the world's most active beverage industry segment in terms of new product launches – and Europe is the most dynamic market in this regard. According to the market researchers at Innova Market Insights, half of all new launches in the European soft-drinks sector between 2015 and 2016 involved fruit juices and fruit juice drinks. Right now the world of fruit juice is in transition. Two defining key phrases in its global development are: naturalness ('back to nature') and innovation. Get inspired on page 164 ff!

More than 170 fruit juice and fruit wine industry representatives from 23 countries came together at Erbslöh's Juice and Cider Seminar 2017. Divided into four topic areas the attendees were brought up to date by a series of presentations. The topic areas were fruit juice and filterability, all about cider and modern fruit wines, heavy metals in fruit beverages and new trends in the beverage industry. A detailed report highlights this event on page 170 ff.

Enjoy reading!

Yours,



M. Knecht

PROCESS TECHNOLOGY

Miguel Sanchez

Cold extraction for veggies 154



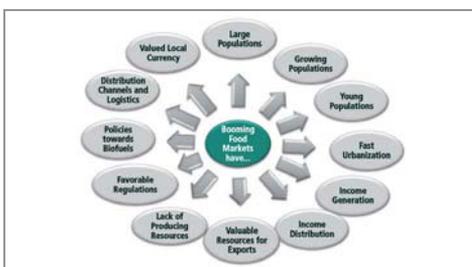
Nowadays everyone is convinced about the fact that the juice industry has become “greener”. The Veggie fashion has strongly arrived to the juice market in order to full fill the low sugar content beverages demand. The sugar persecution policies, supported by some health organizations, have pointed fruit juices as one of the responsible of the epidemical obesity suffered across the most developed countries without considering the additional nutritional value behind. In any case, the juice industry faces a new scenario and there are still many gaps to cover at production level. New product developers

around the world are waiting for new processing solutions to support their innovative recipes. In this context, JBT, as a well-recognized technology provider within the liquid food industry, is concerned about this trend and the necessity of developing and applying new processing technologies. One of these technologies is the ...

MARKETS

Marcos Fava Neves, Vinícius Gustavo Trombin

Where to expect food and juice markets growth in the world 159



After reading several studies that analyze the mature markets, when we look at our future possibilities for the food and juice consumption, this article comes as an exercise in order to evaluate which countries in the world are showing the biggest opportunities in terms of growth and what are the major characteristics that they share, representing the future for food and juices commodities, and then value added products when income growth is more present ...

IMPRINT

Publisher

Evi BRENNICH

Editorial Office

Editor-in-Chief: Evi BRENNICH
editorial@fruit-processing.com

Editor: Marco BRENNICH
marco.brennich@fruit-processing.com

Advertising

Cornelia HEBBE
cornelia.hebbe@fruit-processing.com

Advertisement Rates:
Current price list 2017 on request and at
www.fruit-processing.com

Readers' Service

Christian FRIEDEL
christian.friedel@fruit-processing.com

Subscription Rate (print)

Europe: EUR 115 incl. mailing cost
Overseas: EUR 124 incl. mailing cost

Cancellation: Written notice one month prior to the end of the subscription period.

Layout

confructa medien GmbH
D-56587 Oberhonnefeld, Germany

Address for all Communications:

confructa medien GmbH
FRUIT PROCESSING
Westerwaldstrasse 2a
D-56587 Oberhonnefeld, Germany
phone: +49 (0)2634 9235-0
fax: +49 (0)2634 9235-35
editorial@fruit-processing.com
www.fruit-processing.com

Inhaberverhältnisse gem. Pressegesetz Rheinland-Pfalz
Evi Brennich 51 %, Guido Hoffmann 26 %, Lothar Hoffmann 14 %, Hubert Brennich 9 %;
Geschäftsführende Gesellschafterin: Evi Brennich
HRB 14556 Montabaur

Printed by:

mohr medien GmbH, Metastraße 3,
D-56579 Rengsdorf, Germany

Note:

The views and opinions expressed by the authors do not necessarily reflect those of the publisher or the editorial staff.

Original science and research papers will be presented for scrutiny to a member of the Peer Review Board. All manuscripts must be written in English. If English is not the author's primary language, the author should obtain assistance.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means without the written permission of the publisher.

FRUIT is read in over 115 countries by more than 30,000 readers per issue.

Publication frequency (print/digital): monthly

© Copyright 2017 confructa medien GmbH, Westerwaldstrasse 2a, D-56587 Oberhonnefeld, Germany

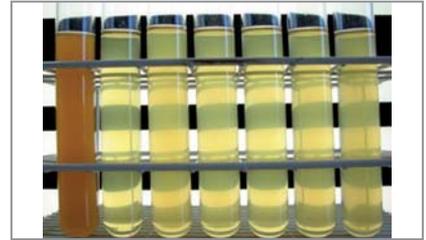
ISSN 0939-4435,
Printed in Germany

PROCESS TECHNOLOGY

Dr. Ilona Schneider, Dr. Günter Maier

How new mash enzymes save time and increase apple juice yields 161

A new mash enzyme was specially developed for processing apple mashes. A special combination of polygalacturonase and pectinmethylesterase offers faster and more efficient pectin breakdown, as well as increased yield and pressing capacity. Compared with the standard mash enzymes of the old generation, this combination offers three additional advantages ...



MARKETS

'Back to nature': The fruit juice revolution. 164



The world of fruit juice is in transition. The two defining key phrases in its global development are: naturalness ('back to nature') and innovation. A contradiction? Bösch Boden Spies GmbH & Co. KG proves otherwise. With high-quality fruit raw materials from all over the world and sustainable product concepts, the Hamburg-based company offers producers and suppliers alike the basis for lasting success in the increasingly dynamic fruit juice market ...

EVENTS

IFU Technical Workshop Valencia 168
Cider Seminar 2017 170

REGULAR SECTIONS

Editorial 151
Imprint 152
Business News 179
Business Contacts 183
Market Price Report 184
Peer Review Board 186
World of Fruit Processing 187

INSERT NOTE:

Please pay special attention to the inserted visitor guide by Messe München.



Cold extraction for veggies

| Beverages | Cold Extraction | JBT | Low Sugar Content | Veggies |

1 Introduction

Nowadays everyone is convinced about the fact that the juice industry has become “greener”. The Veggie fashion has strongly arrived to the juice market in order to full fill the low sugar content beverages demand. The sugar persecution policies, supported by some health organizations, have pointed fruit juices as one of the responsible of the epidemical obesity suffered across the most developed countries without considering the additional nutritional value behind. In any case, the juice industry faces a new scenario and there are still many gaps to cover at production level. New product developers around the world are waiting for new processing solutions to support their innovative recipes.

In this context, JBT, as a well-recognized technology provider within the liquid food industry, is concerned about this trend and the necessity of developing and applying new processing technologies. One of these technologies is the Cold Extraction Turbo Finisher, FTE-CE.

2 FTE-Cold Extraction

Born in JBT Parma (Italy) for the Fruit and Tomato Extraction (FTE), this technology quickly showed a great flexibility while processing many other types of raw material. For



Fig. 1: Celery Juice obtained through a Cold Extraction Turbo Finisher, FTE-CE © all JBT

that reason, to better understand the capabilities of the extractor within the new trend, a machine was installed at the JBT Pilot Plant in Parma where both internal and with customer assistance trials were carried out during several years. As well as tests performed at customer facilities.

What does Cold Extraction Turbo Finisher mean? The extraction of the juice is done by applying a centrifugal force inside of a rotor with paddles which disintegrate the product into small particles. The mentioned centrifugal force squeezes those particles versus a screen or sieve with a previously selected orifice diameter, from 4 mm to 0,2 mm. Accordingly, the product range possibilities become quite large considering puree, smoothies or cloudy juices. On the other hand, the Cold Extraction concept allows extracting the juice without pre-crushing or pre-heating the product before extraction. A pre-cutter installed at the FTE-CE hopper permits feeding the machine with whole fruits or vegetables with the exception of stone fruits such as mango, peach, apricot, etc., which would previously require a destoner (see info-graph, fig. 3).



Fig. 2: Cold Extraction Turbo Finisher, FTE-CE at parma pilot plant

The “1 step extraction process” has shown several advantages. First of all, not pre-crushing the product before the extraction in a previous machine reduces non desired enzymatic reactions. In the same way, no pre-heating the product would help to preserve natural aroma and improve color. Please note that the enzymatic reaction such as browning or pectin degradation would occur after extraction and may require enzymes deactivation, browning preservation or refrigeration depending on the final product.

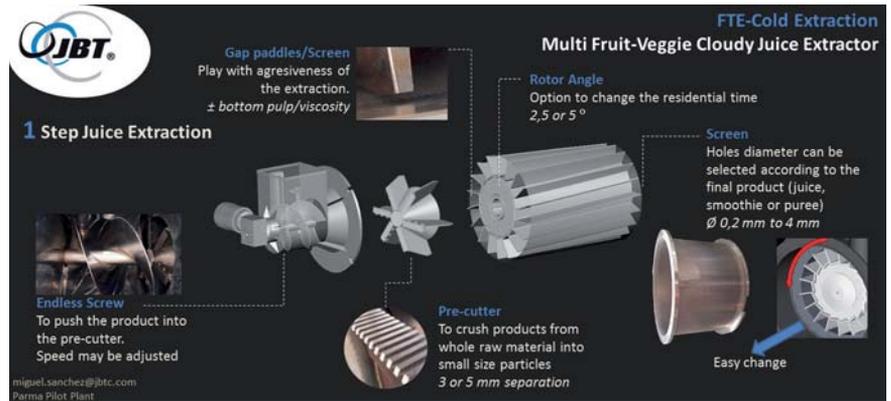


Fig. 3: Info-graph Cold Extraction Turbo Finisher, FTE-CE

In addition, cold extraction keeps integrity of non-edible parts such as peel or seed that may contain residues of pesticides or non-desired flavor, astringency ... removing them before an eventual heat treatment.

3 Process Flexibility

The easy management of the FTE-CE allows processors to work with several raw materials using the same equipment by just regulating the operative parameters to meet the final product's profile. On that way, the operative parameters to play with are: the rotor speed, gap between paddles, the screen holes size, the endless screw conveyer and the rotor angle.

The rotor speed mainly affects the centrifugal force applied to the extraction. Note that the pre-cutter is installed at the rotor shaft, hence both rotor and screw revolutions per minute are equal.

The gap between the paddles and the screen may be regulated in order to modify the aggressiveness of the extraction. A smaller gap would mean a more aggressive extraction which would result in less waste moisture but in more fibers going into the final product. More fibers could not be desired for cloudy juice where bottom pulp may be required to be low.



Fig. 4: Recipe created with FTE-CE

The screen orifices diameter is one of the most important parameters and could be also modified in order to meet the product specifications such as viscosity, puree containing peel spots (zucchini puree) or kiwi smoothie with or without seeds. A bigger orifice's diameter would mean higher viscosity and bigger particle size.

On the other hand, changing the rotor angle would modify the residential time of the raw material inside the extractor. Some products would require less residential time than others to avoid an excessive extraction. This is the case with very soft berries.

The above mentioned modifications may be done while the machine is continuously running, through a PLC (speed) or manually (Gap) except the change of the screen and rotor angle. Whenever the screen or the rotor angle needs to be changed by another size or inclination angle, the machine has to be stopped and the door opened for a very quick operation.

4 CIP and continuous process

To highlight, other advantages of this processing technology are its facility to be cleaned by using its own automatized “Clean In Place” configuration but also, its in-line processing system which avoids batch productions.

If required the same CIP configuration would allow rinsing the machine between products with no need to remove or dismantle any part of the extractor decreasing running times.

5 How to work with an FTE-CE

New product developers or processors looking for a place within the veggie market will quickly realize the potential of FTE-CE.

A veggie juice is currently made by a blend of different vegetable juices or purees within a fruit juice base.

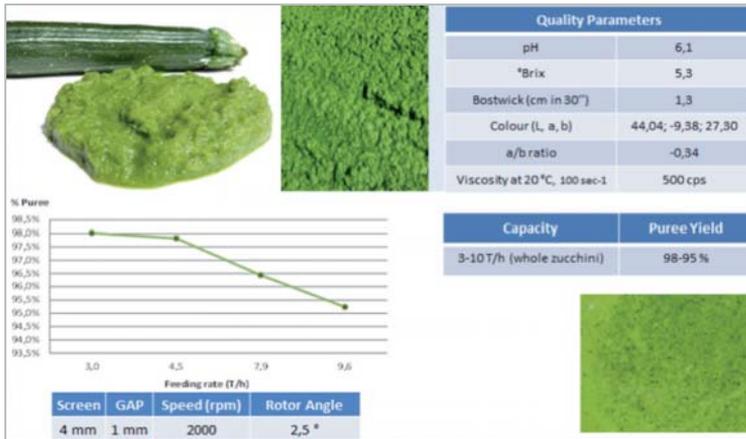


Fig. 5: Zucchini puree obtained through FTE-CE

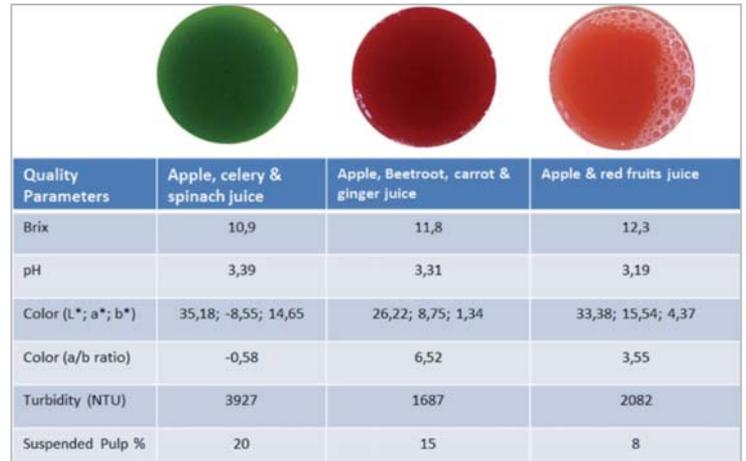


Fig. 6: Different recipes from the market obtained through FTE-CE

Although it is common to read on the labels: apple juice 80 %, and spinach puree 3 % or 4 % with ginger puree, some drops of lemon juice to reduce the pH and so on.

The reason why the use of a fruit juice as a base is much extended, is mainly due to the sweet flavor balancing and the fact that apple, pineapple or citrus juice are economically feasible. But using a cloudy fruit juice also allows the addition of vegetable purees which remain diluted into the final juice recipe with a reasonable percentage of pulp.

FTE-CE allows to create recipes directly from juices as ingredients, instead of using a puree. In addition, feeding at the same time, the raw material in a previously calculated ratio reduces the running time and avoids situation when a juice needs to be waiting in a buffer tank for another ingredient to be extracted.

On the other hand, it is absolutely necessary to highlight that not every veggie juice has fruit juice as a base. Good

examples are carrot or beetroot juices from Poland and the Spanish Gazpacho.

Purees and cream soup from vegetables can also be produced by only changing the screen size, an operation that takes a couple of minutes by a trained operator.

The info-graph, fig 5 and 6, shows that potential.

After extraction and due to the centrifugal mechanism, a cold deaeration would be needed to eliminate possible formed foam (pineapple juice for instance) and decrease dissolved oxygen to increase quality and preserve the best conditions during the product shelf life.

6 Preservation

Next step is related to the preservation treatment, and here refrigeration, pasteurization, sterilization or high pressure processing technologies are included. In addition,

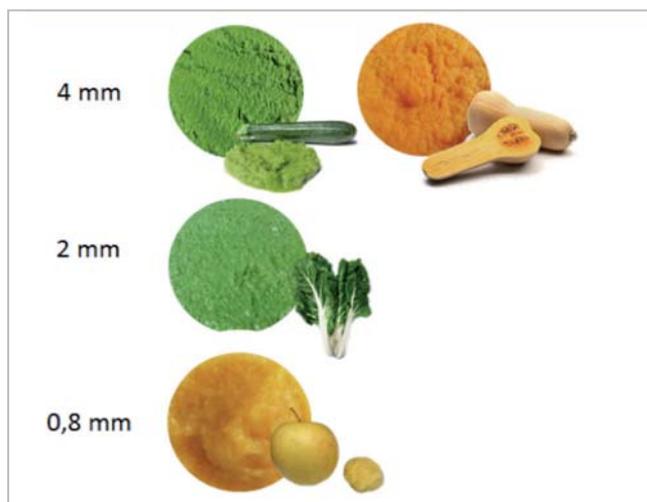


Fig. 7a + b: Examples of product profiles by screen hole \varnothing

among the mentioned preservation methods, a heat treatment with the JBT Sterideal-Ohmic®, Radiofrequency, and Pulse Electric Field are excellent solutions to considerably reduce the cooking value and obtain an enzymatic and microbiological stable product.

With the aim to support processors and formulators to completely understand the whole process, JBT offers its Research Center & Pilot Plant in Parma to test and compare different processing alternatives. Parma Pilot Plant is part of the JBT's global R&D and Pilot Plants facilities localized around the world.



Author:

Miguel Sanchez

R&D and Pilot Plant Engineer,
Liquid Food Solutions
John Bean Technologies SpA
43122 Parma/Italy
www.jbtcorporation.com

JBT in brief

John Bean Technologies Corporation (JBT) is a leading global technology solutions provider to high-value segments of the food processing and air transportation industries. JBT designs, manufactures and tests service technologically sophisticated systems and products for their customers.

JBT Fruit Processing products:

Fruit and juice processing solutions that extract, concentrate and aseptically process citrus, tomato and other fruits.

High Pressure Processing (HPP) solutions for fruits and vegetables, juices and smoothies, and dairy products.

Study Confirms Safety of HPP Coconut Water

Results of study show C. botulinum spores are unable to germinate, grow or produce toxin in fresh coconut water

In response to regulatory concerns of the potential risk of *Clostridium botulinum* in coconut water, Avure Technologies commissioned the Institute for Food Safety and Health (IFSH) in Bedford Park, Illinois, to investigate fresh coconut water with a pH above 4.6. The objective was to determine if it could support the growth and toxin production of non-proteolytic and proteolytic strains of *C. botulinum* at 4 °C and 10 °C. The results from the comprehensive study indicate that spores of strains of *C. botulinum* are unable to germinate, grow and produce toxin in fresh coconut water, alleviating any potential concern of botulism.

“Since it is well known that HPP does not inactivate *C. botulinum* spores, this study investigated the potential for spores to germinate, grow and produce toxin by proteolytic and non-proteolytic *C. botulinum* in both filtered and unfiltered fresh coconut water treated with HPP and stored for 45 days,” said Dr. Errol Raghubeer, Senior Vice President Microbiology and Technology at Avure.

Although there was an increase in the total anaerobic count during the 45 days of storage, none of these samples showed toxin production.



“With proper temperature control, HPP remains the preferred method for treating coconut water”, Dr Errol Raghubeer, Senior Vice President Microbiology and Technology at Avure

“While we agree that there is the potential for *C. botulinum* contamination in coconut water, this comprehensive study proves to us that HPP, combined with potential natural elements found in coconut water, is an effective food safety measure,” Dr Raghubeer said. “It is likely that naturally occurring inhibitory compound or compounds in coconut water, make *C. botulinum* unable to germinate, grow or produce toxin, or that coconut water lacks certain key

ingredients to promote growth and toxin production of *C. botulinum*. HPP of coconut water is a viable process for the inactivation of other vegetative pathogens of concern such as *L. monocytogenes*, *Salmonella* and *E. coli*.”

With proper temperature control, HPP remains the preferred method for treating coconut water to ensure food safety while maintaining the best flavour and keeping nutrients intact.

Data from this study will be made available to processors to use when discussing food safety issues with the Food and Drug Administration (FDA) and other regulatory officials.

JBT Acquisition of Avure Technologies

John Bean Technologies Corporation (JBT) purchased Avure Technologies Inc. in February 2017. With HPP's rapidly expanding market adoption and broad application across protein and liquid foods, JBT can now offer comprehensive thermal and non-thermal pasteurization solutions to global food and beverage producers. Avure will benefit from JBT's global salesforce and responsive aftermarket support, as well as the Company's commitment to developing next generation equipment that delivers the lowest total cost of ownership by optimizing throughput and reliability.

UNITED CAPS to open manufacturing facility in Malaysia

UNITED CAPS, a global reference for the design of high performing plastic caps and closures, announced an investment in the development of manufacturing capabilities in Malaysia. The company will be building a state-of-the-art manufacturing facility to meet increasing customer demand in the region for its advanced caps and closures.

“We are experiencing significant growth in Southeast Asia,” said Benoît Henckes, CEO. “In keeping with our ‘Close to You’ strategy, this expansion of manufacturing



The Kulim High Tech Park, the optimum location for the new manufacturing facility
© United Caps

UNITED CAPS in brief

UNITED CAPS is a global industry reference for the design and production of high performance plastic caps and closures. Extensive innovative capabilities and a broad portfolio of advanced standard and bespoke solutions make UNITED CAPS a preferred partner for the world's leading companies. We support our customers' value chain by safeguarding product integrity, assuring safety and consumer health and ultimately protecting brand reputation. A highly dynamic and flexible family-based group, UNITED CAPS offers end-to-end solutions to serve a wide range of applications and markets around the world. The company is headquartered in Luxembourg and has manufacturing facilities in Belgium, France, Germany, Hungary, Ireland, Luxembourg and Spain. Employing more than 500 people, UNITED CAPS's turnover amounts to 131 million Euros (as at end 2016).

capabilities allows us to continue to capitalise on the dynamic growth opportunities in the region and better serve our local customers. Localising production of our pioneering closure technologies in the Southeast Asian marketplace is the next logical step in our business expansion.”

UNITED CAPS conducted an extensive search and determined that property in the Kulim High Tech Park provided an optimum location for the new manufacturing facility, expected to be fully operational in the first quarter of 2018.

“This investment will initially create more than 20 new jobs in the region,” Henckes added, “and enable the local production of about 300 million closures in the first year. We are excited about the opportunity to bring our advanced technology to the new facility, and also to support the local community with jobs and other opportunities.”

Where to expect food and juice markets growth in the world

| Emerging Economies | Juice | Market Growth | Market Intelligence Systems | Producing Resources |

After reading several studies that analyze the mature markets, when we look at our future possibilities for the food and juice consumption, this article comes as an exercise in order to evaluate which countries in the world are showing the biggest opportunities in terms of growth and what are the major characteristics that they share, representing the future for food and juices commodities, and then value added products when income growth is more present.

The objective here is to contribute with Fruit Processing readers with a model to understand the variables to help building marketing intelligence systems.

Before showing the common characteristics, let's take a look in to some interesting numbers about emerging economies to give the flavor to our model. Indonesia has around 252 million inhabitants, KFC opened the first outlet in 1979 and in 2013 they had around 470 restaurants. In 2011 Indonesia had 5.900 fast food restaurants and in 2017 they expect 9.000 units. Nigeria has 175 million inhabitants. KFC opened the first restaurant in 2009 and had around 25 units after 3 years, and fast food industry is growing more than 10 % per year.

McDonalds started in China in 1990, and now has 2.000 restaurants, being the third largest market with US\$ 2.8 billion in sales in 2013. Vietnam has almost 100 million inhabitants. Fast food market is growing 26 %/year and the number of restaurants tripled in 5 years. KFC opened the first restaurant in 2011 and now has 140 restaurants offering 4.000 jobs. McDonalds opened the first restaurant in 2014 and had 20.000 customers in the first two days. Pakistan has almost 200 million inhabitants. It is a market of US\$ 1 billion/year and growing 20 %/year.

These booming fast food numbers happens because these companies conquered reliability of the consumers due to more reliable food supply chains and awareness of health issues. We also see a westernization of younger generations with bigger use of mobile devices.

After seen some of these incredible numbers of food and juice markets growth, in order to predict which countries will offer the most attractive opportunities for our food and juice companies, let's see some characteristics they may share in common.

The 12 factors we have to observe to identify booming food markets in the coming years (see fig. 1):

- 1 Large populations (in amount of inhabitants);
- 2 Growing populations (rate of growth of the population);
- 3 Young populations (propensity for growth);
- 4 Fast urbanization (high % of people still in rural areas and moving to cities);
- 5 Income generation (GDP growth);
- 6 Income distribution (growing middle class);
- 7 Has resources of value being exported (oil/gas/minerals) generating capacity to pay for food imports;
- 8 Lack of producing resources (low land availability, low water availability, lack of other resources and capacity to invest and receive foreign direct investments in food and juices production);
- 9 Regulations that favor food and juice imports (openness to imports, low trade barriers like import taxes, quotas, sanitary barriers and lower sensitiveness bringing smaller efforts towards food security/local production) and stability of governments/ institutional environment;
- 10 Adoptions of policies towards blending biofuels to petrol;
- 11 Availability of import distribution channels and feasible logistics. Attractiveness for international retailers to enter using global sourcing strategies to bring food and juices to these countries.
- 12 Exchange rates favor food and juice imports (valued local currency).

In a deeper analysis, table 1 shows the factors to be analyzed, the indicators and the sources where we can find information to build our intelligence systems.

How to use this framework? When preparing an analysis of the markets, each of these twelve factors can receive a



Fig. 1: Characteristics of booming food markets

score from 0 to 10 for the establishment of a country's score on each of the factors. The final score serves to identify which countries in the world are showing the greatest opportunities of growth for the food and juices industry

and to analyze what key features these large markets have in common.

We will see a lot in these countries, and big surprises since these environments normally still have a lot of street markets, informality in food chains and lack of availability of some data. Suddenly we see a country starting to import a lot, and it was not predicted. These are some characteristics of "must have" markets for global consumer goods companies in the coming years and opportunities for food exporting countries.

Authors:



Marcos Fava Neves
University of São Paulo, Brazil



Vinícius Gustavo Trombin
Markestrat Research Center, Brazil

Table 1: Factors and indicators

| Factors | Indicators | Source |
|---|---|--|
| 1. Large populations | Number of inhabitants | United Nations |
| 2. Growing populations | Average of percentage of population growth in the last four years | United Nations |
| 3. Young populations | Percentage of inhabitants up to 14 years old in 2016 | United Nations |
| | Average growth in the last four years | United Nations |
| 4. Fast urbanization | 2016 urban percentage | World Bank |
| | Average growth in the last four years | United Nations |
| 5. Income generation | 2016 annual GDP | United Nations |
| | Average growth in the last four years | United Nations |
| 6. Income distribution | Gini index | World Bank |
| 7. Valued resources | 2016 exports of goods and services | World Bank |
| | Average growth in the last four years | World Bank |
| 8. Lack of producing resources | Arable land (2016 and 4 year's growth) | World Bank |
| | Water availability | World Bank |
| | Foreign investments | World Bank |
| 9. Regulations that favor food and juice imports | Food import taxes | World Economic Forum – Global Competitiveness Report |
| | Trade barriers | World Economic Forum – Global Competitiveness Report |
| | Stability of governments and institutional environment | World Economic Forum – Global Competitiveness Report |
| 10. Adoptions of policies towards blending biofuels to petrol (mostly for food) | Percentage of biofuels mixed with petrol fuel | Global Renewable Fuels Alliance |
| | | |
| 11. Import distribution channels and feasible logistics | Goods market efficiency | World Economic Forum – Global Competitiveness Report |
| | Transportation infrastructure | World Economic Forum – Global Competitiveness Report |
| 12. Valued local currency | Exchange rates of the last 4 years (dollar) | World Bank |

“Bringing out the best”

How new mash enzymes save time and increase apple juice yields

| Apple Juice | Enzymes | Field Trials | Pectin Test | Yield |

Apples are among the best-known and most common fruits, and were introduced to the world back in ancient times from Asia via Europe. Their popularity is partially due to the fact that they are easy to cultivate and very adaptable to different environments. Apple cultivation is particularly common in regions between 30 and 60 degrees latitude in both hemispheres.

According to information from the FAS/USDA [Foreign Agricultural Service/US Department of Agriculture], global apple production in 2016/2017 was around 77.6 million metric tons. The main producers included China (56 percent), the EU (16 percent), the United States (6 percent) and Turkey (3 percent) [1].

Advancements in the areas of production, storage, preparation, product development and marketing have brought about a sustainable and dynamic agricultural industry, which serves food and beverage markets worldwide with eating apples, apple juice, apple juice concentrate (AJC) and other drinks containing apple juice. In order to be able to meet demand despite natural fluctuations in the raw

material and varying requirements for different consumer products, apple juice producers are using mashing enzymes to optimize the juice yield and increase the processing capacity.

To this end, liquid enzyme formulations were developed, and are added directly to the crusher or to the storage tank after crushing. During the maceration time, which is around 30 to 60 minutes, the pectolytic mashing enzymes primarily break down the soluble pectin (smooth region) and to a lesser degree the insoluble protopectin (hairy region). The result is increased juice yield and reduced juice viscosity [2].

A new mash enzyme was specially developed for processing apple mashes. A special combination of polygalacturonase and pectinmethylesterase offers faster and more efficient pectin breakdown, as well as increased yield and pressing capacity. Compared with the standard mash enzymes of the old generation, this combination offers three additional advantages.

Table 1: Parameters for industrial processing of apple mash with two different mashing enzymes (Panzym® is a registered trademark of Eaton)

| Parameters | Mash enzyme I (new generation) Panzym® YieldMASH XXL | Mash enzyme II (old generation) Reference enzyme |
|--|--|--|
| Apple variety | Braeburn/Grannies | Braeburn/Grannies |
| Press filling (t/press cycle) | 12.80 | 12.75 |
| Juice yield [%] | 95.4 | 95.3 |
| Relative juice density [°Bx] | 11.5 | 11.5 |
| pH | 3.35 | 3.35 |
| Filtration flux (based on 11.5°Bx) [l/m ² /h] | 79 (= 276,000 l) | 64 (= 239,000 l) |
| Galacturonic acid (based on 11.5°Bx) [l/m ² /h] | 790 | 950 |
| AJC yield (70°Bx) [kg apples/kg AJC] | 6.73 | 6.60 |

1. The juice contains fewer haze substances, making downstream production processes such as filtration easier.
2. The targeted breakdown of soluble pectin ensures gentle processing of the apples, with minimum release of galacturonic acid.
3. Thanks to specific, highly concentrated pectolytic activities, this new generation of mashing enzymes can also be used at temperatures below 10 °C, and can adapt to different processing temperatures.

The parameters of a large-scale field trial and the results from juice samples and pectin trials with different enzyme variants are presented below.

Field trial results

Two mashing enzymes were tested within the scope of industrial apple mash processing: Mash enzyme I (new generation) and mash enzyme II (old generation). The enzymes were added to a storage tank before pressing, with a dose of 75 ml per ton of apple mash. The processing temperature was 25 °C; the maceration time was 60 minutes. *Table 1* shows a comparison of the parameters and the results of both trials.

In the field trial, the press capacity could be increased by 0.05 tons per press cycle using mash enzyme I in the apple mash. The juice yield was 0.1 percent higher and the AJC was 0.13 kg higher than the mash, which was enzymed with enzyme II. In direct comparison, the increase may not seem particularly significant. However, the difference becomes more apparent if one examines the downstream processes. The filtration flux of the juice produced from the apple mash with enzyme I was 15 l/m²/h higher than that of the juice from the mash treated with enzyme II. The resulting increase in apple juice yield was 37,000 liters per press cycle, thanks to the new-generation mash enzyme.

The juice with mash enzyme I contained 790 mg/l of galacturonic acid, which was 160 mg/l less than the juice with mash enzyme II. The lower galacturonic acid content is the result of targeted pectin breakdown.

Results of juice samples and pectin test (IFU method no. 84)

In the acidified pectin test, one part of juice is mixed with two parts of alcohol consisting of 96 percent ethanol and 1 percent hydrochloric acid in a test tube. The result is visually evaluated after a maceration time of 30 minutes.

Table 2: Relationship between enzyme variants and juice samples (Figure 1) and pectin test (Figure 2)

| Test tube numbers | Enzyme variants |
|-------------------|---|
| 1 | Control |
| 2 | Mash enzyme I – new generation (Panzym YieldMASH XXL) |
| 3 | Mash enzyme I – new generation (reference) |
| 4 | Mash enzyme II – old generation (Panzym YieldMASH) |
| 5 | Juice enzyme I (pectinase) |
| 6 | Juice enzyme II (pectinase) |
| 7 | Juice enzyme III (pectinase) |

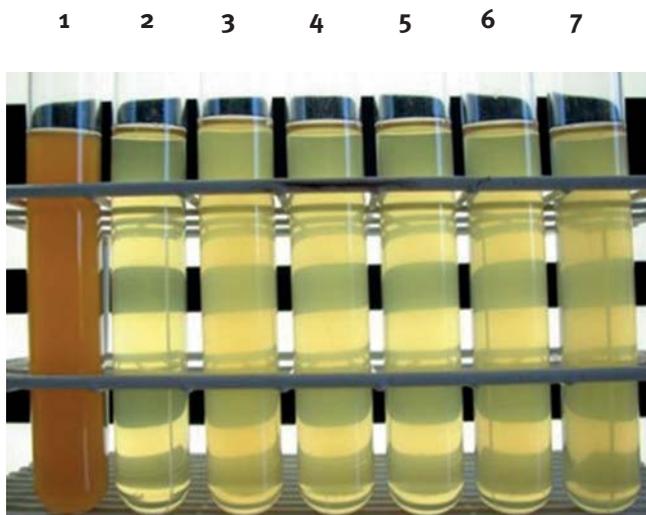


Figure 1: Apple juice samples after pressing
© Novozymes Switzerland AG

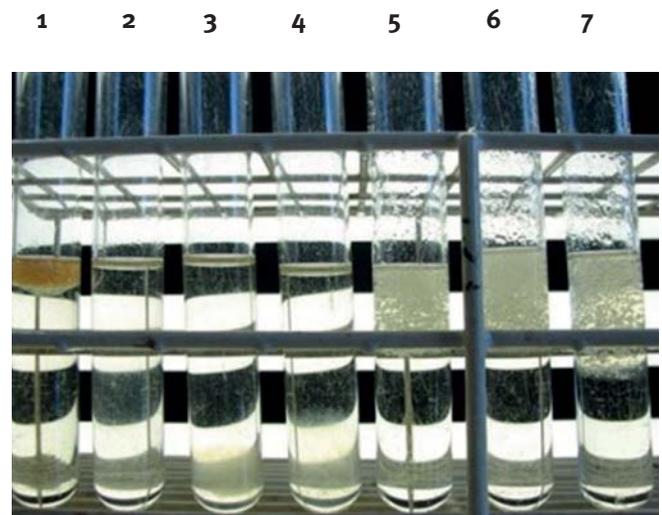


Figure 2: Pectin test after 30 minutes maceration time
© Novozymes Switzerland AG

The alcohol destroys the water sheath of the pectin. As a result, the pectin becomes insoluble and precipitates in viscous form or changes to a slimy consistency. If the sample does not contain pectin, gas bubbles are formed, which are locked in the slime plug and then push the plug upwards in the test tube (see *Figure 2*). In this case, the result of the pectin test is positive. If the pectin test is negative, the juice/alcohol mixture remains clear or slightly flaky, or the residual pectins settle at the bottom.

Figure 1 shows apple juice samples treated with different mashing enzymes directly after pressing (press/decanter). Test tube 2 contains the clearest and lightest sample.

Figure 2 shows the results of the pectin test. Test tube 2 has almost no hazing and hardly any flaking. In other words, the pectin test is negative. Test tubes 3 and 4 also show no hazing, but flakes have settled at the bottom of the test tube, indicating residual pectin. Test tubes 5, 6 and 7 show a clearly visible slime plug with bubble inclusions, indicating incomplete pectins breakdown. The pectin test is positive.

Conclusions

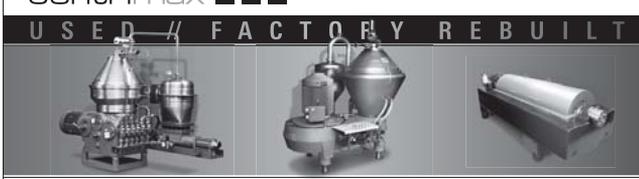
New generation mashing enzymes act selectively and break down the soluble pectin in the smooth region in a targeted manner. The insoluble protopectin in the hairy region remains almost fully intact. The selective pectin breakdown leads to higher juice yield, as it reduces the viscosity of the apple juice on the one hand while maintaining the structure of the mash on the other. The enhanced juice flow optimizes the press capacity and enables gentle processing of a significantly higher apple quantity within the same amount of time. The increase in juice yield also influences the residual moisture of the remaining pomace. It is particularly dry and suitable for pectin extraction or as an alternative to fossil fuels. The resulting apple juice contains few turbidity-forming substances such as polysaccharides and polyphenols. The demand for clarification and stabilizing agents is reduced, and the filtration performance is maximized.

The new mashing enzymes offer the following benefits, particularly during the harvest season, when large quantities of fresh apples with different qualities and degrees of ripeness have to be processed quickly:

- Reduced mashing time (maceration time)
- Mash structure is maintained (no over-maceration), resulting in increased press capacity

centrimax ■■■

USED // FACTORY REBUILT



CENTRIMAX - WINKELHORST
TRENNTECHNIK GMBH
 KELVINSTR. 8 // 50996
 COLOGNE // GERMANY
 TEL.: +49 2236 393530
 FAX: +49 2236 393559
 INFO@CENTRIMAX.COM
 WWW.CENTRIMAX.COM

Centrifuges, separators and decanters from GEA Westfalia Separator, Alfa Laval/Tetra Pak and Flottweg

For clarification / separation of fruit- and vegetable juices

- Hundreds of separators and decanters on stock
- More than 50 years experiences
- Machines equipped with new PLC-control units (Siemens S7)
- Delivery with warranty
- **SALE and Purchase!**

- Fast reduction of juice viscosity
- Increased yield
- Increased filtration flux
- Low galacturonic acid content (not subject to any statutory restrictions)
- Dry pomace (suitable for pectin extraction or as an alternative fuel)

The application is as convenient and flexible as usual. The liquid enzyme formulations can be added directly to the crusher or to the storage tank. The new enzymes help bring out the best in apples, because they enable fast and efficient production of apple juice, apple juice concentrate and other drinks containing apple juice.

References:

- [1] Fresh Deciduous Fruit: World Markets and Trade (Apples, Grapes, & Pears), United States Department of Agriculture, Office of Global Analysis, Foreign Agricultural Service, 12, 2016
- [2] Frucht- und Gemüsesäfte (fruit and vegetable juices, German publication) Ulrich Schobinger, Ulmer Verlag, third edition, 2001, pp. 114 - 116

Authors:



Dr. Ilona Schneider, Grad. Enologist,
 Team Leader Product Management
 Beverage Treatment and R&D
 Eaton Technologies GmbH



Dr. Günter Maier
 Application Manager
 Beverages, Juice and Wine
 Novozymes Switzerland AG

'Back to nature': The fruit juice revolution

| Back To Nature | Beverage Innovation | Clean Positioning | Digital Marketing: Storytelling | High-Quality Fruit Juices |

The world of fruit juice is in transition. The two defining key phrases in its global development are: naturalness ('back to nature') and innovation. A contradiction? Bösch Boden Spies GmbH & Co. KG proves otherwise. With high-quality fruit raw materials from all over the world and sustainable product concepts, the Hamburg-based company offers producers and suppliers alike the basis for lasting success in the increasingly dynamic fruit juice market.

"There is a clear yearning for more naturalness," says Kay Schumacher, Head of Product Application & Development. In his experience, this need grows as society becomes progressively more technologized. Developments in the fruit juice and fruit-juice drinks sector are a good indicator of this. Consumers' taste for ever-new flavours compositions has been growing rapidly for several years. "The beverage market is becoming ever more diversified," says Schumacher. "Many fruit juices nowadays contain raw components that a few years ago would have only been known to specialists." Juice producers around the world are rethinking their products and embracing creativity.

Juicy pace of innovation

The fruit juice segment is regarded as the world's most active beverage industry segment in terms of new product launches – and Europe is the most dynamic market in this regard. According to the market researchers at Innova Market Insights, half of all new launches in the European soft-drinks sector between 2015 and 2016 involved fruit juices and fruit juice drinks. This juicy success story has drawn other beverage variants in its wake. The year 2010 saw the launch of 43 new carbonated soft drinks containing juice; in 2016 the figure had soared to 175. The increase in iced teas with a juice component over the same period is even more impressive – from 6 new launches in 2010 to 113 in 2016. This development puts producers under pressure to innovate, but at the same time opens up entirely new product and marketing possibilities. Providing that you have the right partners.

Since 1913, Bösch Boden Spies has been importing a wide range of ingredients for foodstuffs. The ingredients specialist also makes its vast expertise available to beverage producers and other food producers as a developer of product concepts. "Sometimes it's a single fruit raw material that gives a fruit juice its decisive kick; another time it's the combination of several fruits," says Schumacher. As a supplier and marketer of raw fruit materials, the company's lives up to its own innovation claims by continually deploying 35 sales representatives across Europe. They observe and monitor the market and consumers closely and bring new product ideas from their sales markets. "On the basis of current market trends, we are constantly discovering new potential," explains Schumacher. "We create tailor-made concepts for our fruit raw materials for development and marketing departments."

Innovation with added value

To keep the food industry and retail supplied with new potential applications for fruit raw materials, the specialists make use of the entire range of their fruit ingredients. Every ingredient in the Bösch Boden Spies portfolio has its own characteristic properties that change and upgrade the taste, colour, durability, consistency, or appeal of a



Acerola from Brazil

© all photos Bolasco

juice creation. “We take a very practical approach to development,” says Schumacher. “We can show the customer a given effect directly in the finished application.” The Hamburg experts frequently cooperate with raw material producers’ R&D departments to develop innovations and generate added value for manufacturers and consumers. For example, Bösch Boden Spies worked closely with the fruit producer Ocean Spray to establish various cranberry products in the European market and helped the aromatic fruit achieve its breakthrough in Europe.

Although orange and apple continue to top the world’s fruit bestseller lists, the market is more dynamic than ever before. Consumers have become more demanding. Juices should taste good while also improving health and well-being; they should be exotic and have stories to tell. These requirements are tailor-made for the experienced team of developers and application experts in Hamburg – they are open to innovation, and the fruity basis for their customers’ juices has always come from all over the world. The fruit juice concentrates, purees and not-from-concentrate (NFC) juices usually come from the world market leaders in the respective fruit variety. A selection:

Bösch Boden Spies sources **acerola** from Brazil. The company Niagro specialises in these little vitamin C bombs. Acerola enhances the natural flavour of other fruits and gives juices an exotic, fruity taste without adulterating them. Between 2013 and 2016, acerola was used in 127 new soft drinks products, more than half of them in Germany. The Hamburg ingredients specialist offers the entire range of acerola, from mature flavour / aromatic to neutral / included merely for its vitamin C content.

Plums offered to the fruit juice and beverage industry by Bösch Boden Spies come from California. Sunsweet, the



Cranberries from the Ocean Spray cooperative



Plums from California

world market leader, is based in the Golden State and grows plums with the highest sorbitol content. The number of new juice products with plums in Europe increased from 13 in 2010 to 52 in 2015. Beverage manufacturers can use prune puree or concentrate to significantly reduce the declared sugar and calorie content of juices, for example.

Cranberries grow in North and South America and come from the Ocean Spray cooperative. Cranberries were used in almost 1,500 new soft drinks worldwide between 2013 and 2016 – five times more than in 2007. Besides their high proanthocyanidins content, cranberries are characterised by an intensive-sour to bitter-fruity taste and a bright red colour – ideal for setting new accents.

Wild blueberries from Oxford & Les Bleuets in the Bösch Boden Spies range grow in Canada and have twice the antioxidant concentration of cultivated blueberries. Their mild taste and pleasant fruitiness are indisputable. They are robust, easy to process and ideal for combinations with red fruits. They are mechanically harvested in an environmentally friendly way.

Bösch Boden Spies **physalis (goldenberries/Cape gooseberries)** come from the Andes. Hundreds of farmers here make their living cultivating the high-fibre berries and market them via Terrafertil, the world’s largest producer of dried physalis and physalis juice concentrates. The goldenberries are imported to Europe by Bösch Boden Spies. The most important sales market is Germany. Physalis are also a source of natural antioxidants.

Bösch Boden Spies obtains **ginger** from a leading preserved ginger company, Buderim Ginger. Compared to Asian ginger, the variety from Down Under has a milder flavour with citrus notes. Fruit juice producers can give

their drinks a health-promoting and flavour-enhancing upgrade with ginger juice, syrup or puree from Bösch Boden Spies.

An overview of everything from field to shelf

The market is keenly fought, and premium quality is a decisive success factor – not just in the actual fruit raw material, says product developer Schumacher: “Our products deliver quality across the entire supply chain, from field to bottle. We have an all-encompassing view of our raw materials because we deal with the entire value chain.” To fulfil its ambitious transparency and quality aspirations, the German fruit specialists work together with a manageable fruit portfolio and a few select suppliers – exclusively with a single, certified producer for each focus product.

Long-term partnerships, often cultivated by Bösch Boden Spies over many decades, form the basis for transparency and trust in cultivation, processing and transport. For this purpose, Bösch Boden Spies relies on established Quality Assurance measures. “Our QA department subjects our suppliers to an additional audit to ensure that they meet the requirements of the IFS, our own standards and those of our customers.” Bösch Boden Spies operates according to the IFS Broker Standard and ensures secure traceability of all quality-relevant parameters at the time of delivery. “Close ties and long-term partnerships with suppliers create enormous security for everyone,” says Schumacher from experience.

New taste adventures and 100 % natural

The triumphant advance of high-quality fruit juices goes hand in hand with the growing demand for healthy, ecologically sustainable fruits. Millennials, i.e. those born between 1980 and 1999, are regarded as the core target group. “Back to basics” is one of this generation’s oft-quoted and widely applied guiding principles, but it’s far from the



Dried cranberry fruit concentrate



Ginger juice

only one; many also demand authentic taste and natural origins. The timing for this trend is ideal: ever more sophisticated manufacturing, filling, transport and storage processes allow for ever-better products with fruity ingredients. “Many consumers nowadays are widely travelled and adventurous. They expect more authenticity and originality than before,” says Schumacher. “They like to try things out, are curious, and always looking for new, flavourful experiences from all corners of the world. Most importantly, these experiences have to be genuine, and taste it.”

The trend to new fruit ingredients and thus to new juices necessitates a new, authentic approach to marketing health-promoting properties and functionalities. “In my opinion, the opportunity for the fruit juice industry lies in the fact that they don’t have to provide any complicated explanations about what 100 % natural means. That becomes a lot more difficult for soft drinks based solely on granulated sugar,” says Schumacher. “Our ingredients make it possible to produce beverages with appealing colours and flavours, and at the same time to position a product as having added health value.” Schumacher and his team are committed to providing innovative beverage manufacturers with comprehensive solutions based on natural products.

It has to contain what it says on the label

The current fruit juice trend towards all-authentic products opens up enormous opportunities for the entire industry. One magic word for success is “clean labelling”. Consumers are increasingly demanding more products with clearly

MARKETS

declared natural ingredients and an environmentally friendly supply chain. Innova Market Insights sees this as a decisive trend for 2017. The market research institute predicts that this year, slogans such as “Clean Supreme” (maximum naturalness and eco-friendliness) and “Disruptive Green” (switch to environmentally friendly production technologies) will top the trend rankings. Label claims such as “natural” and “premium enjoyment” will be particularly well-received on new juice products in Europe, according to Innova Market Insights. Clean positioning is a must for beverage manufacturers, but they have to be honest.

In this context, Bösch Boden Spies benefits from its manageable fruit portfolio. The collaboration with a few, highly specialised fruit suppliers creates the best preconditions for perfect transparency in production and transport. Sustainability is also still high on consumers’ agendas. Conscious fruit-juice drinkers want to be sure that production is fair and forward-looking throughout: from cultivation to harvest, production, and transport. This is why Bösch Boden Spies has formulated in-house sustainability criteria and demands that suppliers have a CSR strategy. Environmental protection and social responsibility towards the population and employees are obligatory. “Most Bösch Boden Spies suppliers are GlobalGap-certified,” assures Schumacher. “We also support suppliers in implementing our customers’ CSR requirements.”

Stories help create a premium hit

Schumacher believes differentiation is a success factor in fruit juices. “The individuality of raw materials is a prerequisite for creating premium products.” And advertising them. Digitalisation and globalisation play into the hands of the producers’ marketing teams. Juice drinkers not only

want flavours, but also images and stories from distant lands. Another trend that fruit juice producers can cater to beautifully, as fruit juices contain so many stories. Where does the fruit come from? Who harvested and processed it? How do the farmers live and what do their homes look like? Interest in the origin, processing, social commitment, and people behind the product is growing and growing.



Kay Schumacher, Head of Product Application & Development

Information about exotic fruits from places with melodious-sounding names are particularly in demand. Kay Schumacher: “Basins – known as bogs – full of red berries during the cranberry harvest, farmers in the Andes fixing every single physalis vine at an altitude 3,000 metres, or landscapes with plum trees in blossom as far as the eye can see – the images of our raw material suppliers stay in consumers’ minds for a long time.” And so, the consumer’s demands are an ideal stepping-stone for what should be on the agenda of every company’s digital marketing: storytelling – in online and print form, with photos and films, on social media channels and websites. The current fruit juice revolution under the motto “Back to nature” offers creative producers great opportunities and enormous market potential in many ways.

www.bolasco.de

ZIEMANN
CIMC ENRIC



HOLVRIEKA
CIMC ENRIC

TANKS & PROCESS TECHNOLOGY

ZIEMANN HOLVRIEKA provides effective solutions for turnkey storage terminals in ports, as well as aseptic installations for the land and sea transport. This includes the process technology, cooling, cleaning and the complete automation. We are experts for aseptic design and provide more quality in every single drop.



International Fruit and Vegetable Juice Association (IFU) Technical Workshop 2017

| IFU | Technical Workshop | Valencia |

The IFU was delighted to share Valencia's celebrations as FAO (Food and Agricultural Organisation of the United Nations) World Food City 2017 by holding the technical workshop there as part of the official program of events. Located in one of Europe's largest citrus growing and processing areas it was the perfect location to have a technical tour the day after the workshop to renowned local research centres (IVIA and AINIA) plus the modern orange processing plant, Zuvamesa. The objective here is to contribute with FRUIT PROCESSING readers with a model to understand the variables to help building marketing intelligence systems.

The record number of participants were welcomed by the IFU President, Dirk Lansbergen (Citrosuco) who thanked the experts for their presentations and the sponsors GfL, TansOcean and Zumosol.

David Berryman (David Berryman Ltd) delivered a lively and energetic first presentation "When the going gets tough". David reminded that whilst the natural sugars in fruit juices are occasionally demonised, sugar is essential for good nutrition, energy and life! In tough market conditions innovation provides the opportunity for growth and product examples demonstrated this.

Session Genetics

The session was opened by Prof. José Mulet (University of Valencia). Genetic changes are responsible for the variety

of crops harvested today due to natural evolution. It was argued that genetic modification, essential in pharmaceuticals, have an important role to play in future crop development and sustainability. Dr. Manual Talon (IVIA) provided an explanation of genetics and the genealogy of domesticated citrus varieties and how these have and may change in the future.

Session Processing

The session began with an explanation of ohmic heating by Mario Gozzi (CFT). The principles of the technology were explained. The benefits of ohmic heating vs. conventional heating were demonstrated with industrial applications. José Biot (JBTC) showed us that citrus peel from juice processing operations could be recovered and converted into added value products such as ReadyGo™ d-limonene. Continuing this theme of sustainability from waste stream recovery the presentation from Dr. Carlos Bald (AZTI) covered how other products from citrus peel such as fibre (for baking), feed for aquaculture and bio fermentation processes could be obtained. Dr. Edgar Zimmer (Bucher Unipektin) presented how resins can be used in the orange juice stream after extraction for the treatment of defects such as undesirable flavour characteristics because of HLB greening. Overall, resins can serve a useful function in the control of bitterness, acidity, astringency and stability. The session was concluded with Dr. Bianca May (University of Geisenheim) who demonstrated the influence processing aids (bentonite, activated charcoal and



A record number of delegates attended the IFU workshop

diatomite) may have on heavy metals in certain fruit juices, including apple. The presence of vanadium was also highlighted.

Session Quality Assurance

Dr. Susanne Koswig (SGF) lead with information how the international organisation SGF provides quality assurance controls throughout the fruit juice supply chain to ensure only safe and authentic products reach the consumer. The SGF quality assurance programmes are based on audits and analytical controls. Whilst performance in the industry was generally good, suppliers and buyers should remain vigilant and have an holistic view on raw material procurement. Susanne therefore recommended to combine company strategies with the SGF experience in authentication.

Leading onto more specific analytical testing Mikko Hofsommer (GfL and Chair of the IFU Methods of Analysis Commission) presented how cavity ring-down spectroscopy can play a role in the authenticity control of fruit juices by determining the carbon isotopes of sugar, added pectin in pineapple juice and added acid in lemon juice. The method could provide both repeatable and reproducible results. The risk assessment used by Codex Alimentarius for the determination of pesticide MRL's is under review and can have a significant impact on pesticide applications on fruit and vegetables with new restrictions. Monika Richter (BASF) explained what the considerations were and how the review was taking place.

Coconut water has become increasingly popular over the last few years due to its natural intrinsic properties. Whilst it is called a water it is classified as a juice in the Codex fruit juice and nectar standard. Addressing authenticity concerns of some commercially available products Dr. David Hammond (Eurofins) presented the new AIJN code of practice on the coconut water. This details the chemical profile of an authentic product.

Session Microbiology

It had been requested to have more information again on Microbiology so Barbara Gerten (Merck) provided an overview on the microbiology of high pH (>4.5) juices including coconut water. There are greater challenges to control the microbiology of these type of products compared to the more prevalent higher pH juices.

ACB (alicyclobacillus) was again discussed by Sophie Verdier (The Coca-Cola Company) who provided a review of how this organism can be introduced into the juice stream, how to control it when it is in juice and the spoilage mechanisms that may subsequently occur.

The concept of the Ice Gen technology was shown by Annick Casier (Ice Gen). It is used for preparing NFC juices for bulk journeys in non-aseptic conditions by lowering the product temperature prior to loading. This can extend transit times and reduce the risk of microbial spoilage.

The workshop was wrapped up by Piet Haasen (Friesland Campina) and Peter Spaargaren (Doehler) who jointly presented the Sustainable Juice Covenant, which is about putting into action the AIJN Code of Business Conduct and is supported by idh, the sustainable trade initiative. The aim is to achieve sustainable juice by 2030 and the audience was encouraged to offer their support.

Technical Tour

First stop was to the Agricultural Research Centre IVIA, which aims to provide scientific knowledge about agriculture. The site was one of 7 research centres operated including a national reference laboratory on bacteria. In the lecture theatre, we received detailed information from the scientific team lead by Manuel Talon about their research involving the development and characteristics of new varieties plus their activities on improving crop sustainability such as the biological control of citrus pests and agro engineering. As well as the agricultural side, they also consider post-harvest technologies.

The practical side of the industry was presented at the modern citrus processing plant of Zuvamesa. With a fruit processing capacity of 250.000 tonnes per annum they produce NFC orange and clementine juices which can be stored in their 40-million-litre aseptic tank farm. In addition to juices they make juice cells and cold pressed oils. The waste stream is utilised for animal nutrition pellets. After a very thorough tour and tasty lunch provided by the extractor manufacturer Luzzysa the trip continued to the last location AINIA.

AINIA is a private not for profit organisation with 270 scientists and technicians providing a range of services to the industry such as R&D and research projects, analytical services, training, food legislation, consumer studies and industrial services. The tour included the large facility taking in their various pilot plants and laboratories including supercritical extraction plant, processing, chemical and their dynamic digestion equipment used to simulate the intestinal tract in vitro.

Copies of all the presentations are available for members and participants via the website www.ifu-fruitjuice.com

The Technical Workshop 2018 will be held in Cologne on 19th March one day before the opening of Anuga FoodTec.

Juice and Cider Seminar 2017

| Apple Juice | Ceramic Filter Discs | Cider | Cross-Flow-Filtration | Enzyme Cocktails |

More than 170 fruit juice and fruit wine industry representatives from 23 countries came together on 30 and 31 March in Rotenburg an der Fulda, in the heart of Germany, at Erbslöh's Juice and Cider Seminar 2017. The seminar was spread over two days and divided into four topic areas, during which attendees were brought up to date by an extremely informative series of presentations.

The seminar was organised and hosted by ERBSLÖH Geisenheim AG, an international specialist in processing and refining of fruit-based drinks and a leader in research, development and the manufacture of treatment agents.



Dr. Jörg Möller, Managing Director, Erbslöh Geisenheim AG, welcomes international attendees. © all photos confructa

Topic area 1: fruit juice colloids and filterability

Dr. Eric Hüfner (Erbslöh Geisenheim AG): Origin and relevance of colloids in fruit processing

Hüfner explained that colloids are macromolecules of vegetable, microbial or animal origin, which have a great capacity to bind water and ability to swell or form a gel in common. In most cases, the purpose of using enzymes in the fruit-processing industry is to degrade or modify these



Dr. Eric Hüfner's presentation on improving valuable ingredients using fining agents.

colloidally dissolved substances. This can significantly improve filterability, the efficacy of fining agents, or extraction of valuable ingredients.

Peter Dietrich (Erbslöh Geisenheim AG) & Sandra Menz (Hochschule Geisenheim University): Practical tests to assess the filterability of apple juice

Mr Dietrich commenced the presentation, which was split into two parts, by saying that clear apple juice, or AJC, are of outstanding economic importance for the fruit juice industry. The majority of apple juice is clarified and subsequently concentrated using ultra-filtration – a dynamic membrane filter system with a selectivity of <math><100\text{ nm}</math>. He pointed out that these systems' performance is influenced to a great extent by colloid-sized particles.



Peter Dietrich and Sandra Menz explained the economic importance of AJC for the fruit juice industry and documented the effect of specific enzyme cocktails using a colloid-rich juice concentrate.

Ms Menz subsequently explained the test set-up and stated that the effect of specific cocktails of enzymes on filterability using a colloid-rich juice concentrate produced by Erbslöh had been documented. The permeates and retentates obtained were characterised using a broad spectrum of analysis parameters. The suitability of individual analysis parameters for predicting the filterability of apple juice was tested using this database. This knowledge made it possible to devise an individually tailored recommendation for more efficient enzyme treatment of various fruit juices with a small sample volume.

**Franz Fastner (novoflow GmbH):
Dynamic cross-flow filtration using ceramic filter discs**

The NDCF filtration system (Novoflow Dynamic Cross-Flow Filtration) offers particular advantages for operations which filter the sediment in their fruit juices, fruit wines, cider or wines/sparkling wines in order to recycle juice or wine.



Franz Fastner outlined the importance of the right fining agent and enzymatic pretreatment and also explained NDCF filtration from economic perspectives.

Above all, use of the correct fining agent and the correct enzymatic pre-treatment are decisive for high filtration performance by the wide variety of filtration systems.

In addition to many other factors, the manufacturing process is significant for the wine's subsequent quality. A fruit juice producer or winemaker can dispense with some stages in the production process, such as filtration, or consciously decide in favour of them.

Wineries are under enormous pressure to maintain and increase their products' quality as a result of growing global competition with which fruit juice producers and winemakers are faced. The capricious weather of recent weeks and associated frost damage are also giving some businesses cause for concern. This is where introduction of the NDCF filter (Novoflow Dynamic Cross-Flow Filter) may provide a solution for more effective and economic use of the parts of the product contained in the sediment and other deposits and therefore also increase total yield.

The NDCF filter system is not only used to filter must sediment after the harvest, but is flexible enough to be used throughout almost all of the wine-making process. It produces a clear filtrate WITHOUT filtration aids such as cellulose, perlite or kieselguhr and is the ideal technology for treating/processing sediments or flotation deposits from fresh juice, centrifuge discharge from must clarification, sediments after fermentation, yeast sediment from first and second natural clarification (fine lees), fining agent sediments, CMF concentrates (retentate), tartar treatment residues, deacidification sediments, filtration of young wines, as well as filtration after natural clarification (first and second racking), through to bottling preparation.

Dynamic cross-flow filtration is the perfect solution for filtering fined juices or wines after sedimentation and in particular for processing the ensuing sediments, specifically hazes or sediments. This is how Rauner Fruchtsäfte-Konzentrate e. K. in Neuhausen/Germany filters all its coloured juices, for example.

Standard pre-treatment is as follows: enzymation, fining with protein, filtration of supernatant. The hours required are halved where direct filtration after fining is concerned; the output is around 8,000 L/h for clear supernatant. The retentate is also filtered off via a chamber filter press. According to production manager A. Lutz, from Rauner, they have currently achieved the greatest filtration output with cherry juice. All other juices – with the exception of elderberry – have relatively similar filtration outputs.

The advantages and particular properties of the NDCF system are the low energy consumption (compared to customary cross-flow technology), and the dissociation of pressure and over-current speed, which are independently adjustable. This allows trans-membrane pressure (TMP), which is very unusual for cross-flow systems, but very gentle on the product.



Prof. Bernd Lindemann was a professional and expert guide throughout the whole seminar.



For two days Rotenburg an der Fulda became the centre of the fruit juice and cider industries, with more than 170 participants from 23 countries.

The ceramic filter discs used can be individually inspected and replaced. The disc spacing of 10 mm facilitates a very high retentate solid concentration of up to 80 % vol. Very low to no oxygen absorption also guarantees very high product quality.

There is a range of test equipment available for pilots or trials with new products. All the equipment can be used with ceramic filter discs with 5, 7, 30, 60 and 80 nm pore sizes, or 0.2 and 0.5 to 2 µm.

Topic area 2: all about cider and modern fruit wines – presentations and tastings

Henry Chevallier Guild (Aspall Cyder): The future of cider: a retrospective



Henry Chevallier Guild commenced his presentation by asking what cider actually is and predicted the advance of flavoured cider.

Aspall Cyder is an English cider and vinegar producer based in Debenham, Suffolk, 150 km north-east of London. The company was founded in 1728, by Clement Chevallier, after the estate of the same name and describes itself as the world's oldest "cyder house".

Chevallier Guild, the eighth generation of the founding family, asked at the start what cider actually is. According to the dictionary definition, in England cider is understood to be an alcoholic drink made from fermented apples and in North America an unfermented drink made from crushed fruit, usually apples. The word's origins are Hebrew and mean "strong drink".

In Europe, cider production is defined by the European Cider and Fruit Wine Association (AICV) and governed by the Code of Practice. But every region and indeed every country produces differently and customers have different tastes. Taken globally, the definition of cider is even less clear. Producers push the boundaries of what is permitted, and so varieties with kiwi or mango, for example, are retailed in Australia.

Taken historically, cider originated in Europe and is first mentioned by the Romans. In the sixteenth century, 65 % of English people drank "alcohol from apples". "Cyder" was also known as "England's champagne", as the production of bottle-fermented sparkling cider was popular.

The biggest sales markets for cider are Western Europe with 58 %* and North America with 12%* of global consumption. Whilst consumption in Europe is in decline, it is rising in the rest of the world.

Chevallier Guild assumes that the apple will remain dominant, but also sees flavoured cider making advances in the mainstream, as well as experimentation with a wide range of flavours. Nevertheless, high-quality products will always find a place in the market and survive alongside the top dogs, as the current craft cider trend in the USA highlights.

(* Source: GlobalData)

Jörg Geiger (Manufaktur Jörg Geiger GmbH): Industry versus factory

Jörg Geiger GmbH is based in Schlat/Germany, in a region which is home to the world's biggest, continuous meadow orchard, covering 300 square kilometres. The factory processes single-variety fruit harvests from 750 farmers on two production lines, with a capacity of 1,000 and 2,800 bottles per hour and offers more than 10 different products in six categories, which are distributed via more than 1,000 specialist dealers, 1,300 restaurants, and 25,000 retailers.

The factory started by producing high-quality sparkling wine from the Champagner Bratbirne heritage pear. The portfolio now includes PriSecco, which are non-alcoholic sparkling wines, usually from single variety juices, with herbs, leaves and flowers, sweet wines, distillates, cider and perry.



Jörg Geiger explained how to succeed with high quality products without mass production.

Geiger, whose motto is "Schützen durch Nützen", or "Protect through Use", provides experience of meadow orchards and thus increases the added value. His products sell at prices ranging from EUR 7.50 to EUR 35.00.

He does not produce mass-market items, as customers consciously choose products from his factory. He therefore feels it is important to extract the individual flavour of the single-variety fruit. For Geiger, artisanal work is key to high-quality products and, as far as he is concerned, this craftsmanship embodies emotion, passion and the desire for perfection.

**Maximilian Schmelzer (Erbslöh Geisenheim AG):
Options for fermentation and typing**

As cider and fruit wines are alcoholic products, alcoholic fermentation is key to their production. Sensory factors are decided by the metabolic products of alcoholic fermentation, such as alcohol, secondary aromatics and glycerine.

Depending on the type of cider the producer wants to create, he must select the right yeast, yeast nutrient and also the substrate to be fermented. Essentially, cider producers have a choice of yeasts for three applications: maintenance of the typical apple aroma, forced production of aroma by the yeast (aromatic yeasts) and neutral, technical fermentation for cider bases. The choice of yeast must also take into account the desired alcohol content, as there are applications between 6 % and 16 % alcohol.



Maximilian Schmelzer explained the effect of yeasts and other treatment agents on the sensory aspects of cider beverages.

The sensory factors of the ready-fermented product can also be smoothed out by the use of oenological treatment agents. This may be the use of non-sweetening polysaccharides, such as gum arabic, in order to achieve fullness and body, as well as the use of tannins to achieve a bitter note, as in British cider.

The notes created by maturation in a wooden barrel, for example, can also be replicated by using oak chips. Not only is it easier for large businesses to implement this method, it is also more hygienic.

The final point in influencing sensory factors is adsorption of undesirable fermentation products, such as adsorbing H₂S with copper citrate, or silver chloride-based treatment agents, in order to provide consumers with cider of consistent quality.

**Prof. Frank Will (Hochschule Geisenheim University):
German Apfelwein, British cider, French cidre and Asturian sidra – attempt at a definition**

At the start Professor Will provided a brief general overview of the subject of cider, before addressing Apfelwein, cider, cidre and sidra in detail. Samples from each product group were available to taste during the presentation.

Apfelwein, cider, cidre, sidra - the English term “cider” is the generic international name for all these products, but the word’s meaning is not precisely defined. Traditionally cider is made in Great Britain, France, Germany, Ireland and Spain. The global boom is currently being driven by the two biggest cider producers, Heineken and Carlsberg. The strongest growing markets in this segment are Eastern Europe, including the Baltic states, Scandinavia, and North America. The latest trends include flavoured ciders, flavoured with berry fruit, for example, or hops, and craft ciders.



Prof. Frank Will gave a presentation on the various international definitions of cider.

German Apfelwein

Apfelwein is mainly produced in Hesse, Germany, and in Baden-Württemberg. Apple seccos and sparkling Apfelwein are also available in addition to the traditional range. According to legislation, in Germany Apfelwein can only be fermented from apples, apple pulp, apple juice, apple purée, or AJC.

Due to the introduction of wheat beer throughout Germany in the 1990s, per-capita consumption of Apfelwein collapsed from 1.8 litres to 0.5 litres. Flavoured and carbonated products and a modern packaging mix (e.g. can, long-necked bottle) are once again appealing more to a younger target group.

The tasting included a “Speierling”, from Heil OHG, as a classic representative of traditional Apfelwein and a Swabian “Cider Brut”, made from meadow orchard fruit by Jörg Geiger GmbH.

British cider

In the UK cider is understood to be a beverage which is partly or fully obtained by fermenting apple juice (and pear juice, proportionally no more than 25 %). The addition of sugar and/or potable water is permitted before or during fermentation. The English market is characterised by the individual diversity of products. As a result, cider is widely available in pubs and competes directly with beer. By volume, English cider accounts for approximately 7 % of the alcoholic beverages market.



Cider tasting: there's a difference not only in the taste, but also the colour of ciders.

We tasted Aspoll Cyder Premier Cru, a classic bittersweet cider and Aspoll Cyder's Isabell's Berry, a sweet cider flavoured with raspberry and redcurrants.

French cider

The most popular ciders in France are "cidre bouché" and "cidre traditionnelle". A maximum of 50 % AJC can be used in cidre bouché. Cidre traditionnelle is comparable to German Apfelwein. For the traditional production method calcium chloride can be used for keeing, otherwise the food law is very similar to that in Germany.

We tasted a Grand Cidre Rosé from Eccusson, made from pink-fleshed apples.

Asturian sidra

Approximately eighty percent of Spanish cider is produced from 10,560 km² in the Principality of Asturias. The cultivation areas and apple varieties are specified by law. Sidra contains endogenous CO₂ and its origins are protected.

We tasted a Sidra Extra from El Gaitero, a traditional Spanish semiseco cider, made from special Asturian apple varieties.

Topic area 3: heavy metals in fruit beverages

Dr. Bianca May (Hochschule Geisenheim University): Effect of juicing and filtration on metal concentrations in juices

Which process stages influence the concentration of metals in fruit juices? The pressing process has the biggest influence. Only around 30-60 % of the original content of manganese, iron, zinc and copper pass into the juice phase (Anton *et al.* 2016). It is to be assumed that some metals have a strong affinity with pomace and therefore

accumulate in this. A fruit juice therefore exhibits much lower concentrations of these metals than the whole fruit.

If one compares naturally cloudy and clear juices, clear products frequently have higher concentrations of aluminium, iron, lead and arsenic. In the case of these metals it is known that processing aids and treatment agents can lead to their discharge. The use of bentonite can lead to discharge of aluminium, iron and lead. Activated charcoal also introduces small quantities of aluminium and iron into the product, whilst filtration with kieselguhr can introduce arsenic. Aluminium and iron also play a part. Below is an assessment of various commercially available filtration aids (kieselguhr, perlite, cellulose and mixtures of perlite and cellulose) and the aluminium, iron, arsenic and lead they emit. Perlite has much lower quantities of these metals. Only the aluminium released by perlite is on average somewhat higher than that released by kieselguhr. The metal discharged by cellulose was below the limit of quantitation, which speaks for this filtration aid's great purity. Mixture of perlite and cellulose accordingly also release much lower quantities of metals. Compared to other filtration aids, kieselguhr introduces greater arsenic content to the product. The commercially available kieselguhrs varied in quality. Some release just 0.6 mg arsenic per kilogram of kieselguhr, other up to 4.7 mg/kg. According to OIV (Oeno 10/2002), kieselguhrs should not release more than 3 mg/kg arsenic. The results were then checked by pre-coat filtration of apple juice using a highly contaminated kieselguhr and one with little contamination. In each the dose was 150 g/100 kg juice. Under the conditions applied, the kieselguhr with little contamination caused an arsenic discharge of less than 2 µg/L, the highly contaminated kieselguhr discharged up to 7 µg/L. The lowest possible arsenic discharge can accordingly be achieved by selecting a kieselguhr with little contamination, a different filtration aid, or a mixture of the two.



Dr. Bianca May talked about heavy metals in juices and how and why these get into the product.

The discharge of aluminium and iron, on the other hand, was much lower than preliminary tests led us to expect. Where the product with little contamination was concerned there was, in fact, no detectable increase in the concentration. This can be ascribed to the fact that in addition to filtration aids introducing metals, there is also a discharge through the actual sediment depletion during filtration. Some metals also bind to the sediment parti-

cles, as they do to the pomace, and are therefore depleted during filtration.

**Dr. Robert Könitz (Erbslöh Geisenheim AG):
Effect of bentonite treatment on the heavy metal content in fruit juices**

Nowadays there is increasing discussion concerning heavy metals in foodstuffs and beverages too. This goes hand-in-hand with international efforts to continually reduce statutory maximum contents, which is something which the fruit juice industry has to take into account in practice. The current emphasis is on lead and arsenic contents. For many years treatment with natural product bentonite has been known to potentially discharge both these metals into beverages. Tests regarding the contact time and contact temperature, or attempts to modify the priming process, have had very little impact on reducing



Dr. Robert Könitz emphasised the impact of good quality bentonite on potential heavy metal discharge.

heavy metal discharge. Where sustained minimisation of heavy metal discharge is concerned the focus has therefore shifted to bentonite quality. If moderate quantities of good quality bentonite are used, it is expected that there will be no critical discharge into the product. Special bentonite which is particularly low in heavy metals must be used for specific applications, on the other hand, such as fruit which is already contaminated, for example, or in the case of very high dosages due to especially strict stability requirements. In PuroBent®, Erbslöh offers a high purity, quality bentonite to a rigorous specification, which minimises the discharge of heavy metals even under extreme applications.

**Peter Dietrich (Erbslöh Geisenheim AG):
Minimised heavy metal release in coloured juice production**

Fruit juice normally contains far fewer heavy metals than the fruit from which it is produced. Despite this, the media has taken a highly critical stance regarding certain heavy metals contained in fruit-based beverages. Overall, a whole range of operating materials and technical auxiliaries constitute a not inconsiderable source of heavy metals. These include mineral treatment agents and filtration aids. Their use can be much reduced by a technically good enzymatic pre-treatment of fruit juices and fruit wines.



Peter Dietrich stressed that consumption of treatment and filter agents can be reduced by good technical enzymatic pretreatment.

Knowledge of the typical causes of fruit juices which are difficult to clarify or filter is required for this. This leads to selection of the correct cocktail of enzymes and reliable treatment performance monitoring. This considerably reduced the consumption of mineral treatment agents and filtration aids.

**Mikko Hofsommer (GfL – Gesellschaft für Lebensmittel-Forschung mbH):
Analysis of heavy metals – do we speak the same language?**

Mikko Hofsommer, GfL, lectured on heavy metals with regard to analytical questions. The title “Heavy metals – do we speak the same language?” was an early indication that even analysts do not have a clear understanding. Hofsommer, who is honorary Chairman of the IFU Analysis Commission, emphasised the enormous importance of clear specifications and/or reference methods in this context. Taking heavy metals as an example, he explained that there are many different analysis methods and it must consequently be ensured that all these methods also produce comparable, correct values. Performance criteria have to be defined for this and continuous monitoring of the analysis process carried out using reference materials and round robin tests (see ISO 17025). The importance of control charts was furthermore emphasised and an Excel tool introduced, which is provided to download free from <http://www.fluessiges-obst.de/>.



Mikko Hofsommer used heavy metals as an example to emphasise that the different analysis methods must deliver comparable and correct values.

Hofsommer then presented the results of various juice/concentrate tests from last year. Comparison of benchmark and maximum values shows that at the moment no obvious risk can be derived for arsenic. As arsenic generally cannot be proven (determination threshold: 0.01 mg/l), it must be concluded that the fruit juice industry is not affected by current discussions about organic and anorganic arsenic. The picture is rather different for lead.

Here too, it can be seen that juices and similar products generally remain within limits, but the safety margin is much smaller, so that, as Dr May also stated, attention should be paid to potential discharge paths.

As the use of bentonite during fining can discharge lead into the processed product, the question arises how to investigate bentonite for its ability to give off heavy metals. A standard procedure with clear specifications regarding solvent (volume, pH), temperature, time, etc. are necessary prerequisites for subsequent discussion of specifications and benchmarks, as has already occurred in the fields of wine and beer. The fruit juice industry should not lag behind. The IFU Analysis Commission is already devising a standardised approach and is expected to publish this in the next few months.

Topic area 4: new trends in the beverage industry

Claudia Neuhold (ZETA Biopharma): Aseptic technology in fruit processing



Claudia Neuhold explained the benefits of a magnetic agitator and introduced the range of ZETA Biopharma's services.

ZETA provides a comprehensive range of services, which extends far beyond plant construction, from concept, via engineering, automation, production, operator training,

servicing and maintenance, to advice on process-related aspects of the food-processing industry.

ZETA has in-depth understanding of food industry processes due to many years of production experience. ZETA's core expertise includes food manufacturing processes and technologies, making the company an innovative system supplier for processing and finishing of natural raw materials.

Process safety during industrial production of foodstuffs is given highest priority. On the one hand, heat treatment of food and beverages is necessary to extend products' shelf life, but on the other places stress on quality-related product parameters, such as colour, flavour and texture.

ZETA offers customised solutions for the following applications:

- Pasteurisation systems
- Aseptic filling stations (containers, bag in box, tanks, etc.)
- Aseptic dosing systems (enzymes, addition of aromas and colours, etc.)
- Systems for the addition of powdered production aids
- Screening solutions for identifying foreign bodies (metals, seeds, etc.)
- Aseptic sampling devices
- Aseptic agitation and mixing tasks

For many years ZETA has successfully used magnetic agitator technology for food industry aseptic agitation tasks. An innovative new development, the ZETA Container Magnetic Agitator, has the advantage that there is no connec-



There was plenty of opportunity for the specialists to chat at the evening event...

tion between the multiway container's aseptic product space and the external atmosphere. Power is transferred from the motor to the agitator via a magnetic clutch.

The advantages of the container magnetic agitator over slide ring-sealed agitators are obvious. There is no need for a shaft in the container, which precludes contamination of the aseptic product area with microorganisms caused by the shaft seal. This agitator technology is also convincing because it is extremely reliable and requires very little maintenance.

The Container Magnetic Agitator opens up new possibilities for product developers, especially in the field of "clean label" products, as it facilitates homogeneous filling of products without stabilisers and emulsifiers. Of course the hygienic design means it is also easy to clean and sterilise. The agitator's flexibility should also be emphasised, as several agitators can be operated by just one drive unit via an easily removable connection (e.g. dairy coupling).

**Dr. Martin Ernst Haug (beverage consult):
New trend beverages with plant extracts**

Current examples of products were used as the basis for an examination of newly introduced beverages, in particular at BIOFACH 2017. The emphasis was on the ingredients, aromatic and flavour extracts, technology and manufacturing stages.

Very many products contained extracts of tea or plants (botanicals), produced using traditional extracts, with hot water. The products were sweetened with fruit juices or fruit juice concentrates, or alternative sweeteners such as



Dr. Martin Ernst Haug presented on new beverage concepts with a very wide range of ingredients.

grape sugar, apple sweetener or agave syrup. The sugar contents were generally much lower than for customary soft drinks. The ratio of sugar to acidity was controlled using lemon juice or lemon juice concentrate. The ingredients were predominantly organic quality.

In addition to the ingredients, the concepts fall into two categories – classic production technology (simple) and craft.

Stability in particular needs to be checked, as these are recipes about which little is known. This is carried out in the form of stress tests in the oven at 32 °C, with and without light, for several weeks. Important parameters to observe include sensory factors (smell, taste, colour), as well as chromaticity, hazing and oxygen content. The presentation continued by covering the conditions and expertise which are required for this, taking as an example facilities at the University of Applied Sciences Niederrhein's Ecotrophology department, in Mönchengladbach.

It emerges that the latest trend in beverages is moving in the direction of drinks which are produced with cold extracts, using infusion.



... one or two tips to take home or back to the production plant.

**Karl-Heinz Kubach, Kay-Uwe Lührs (Erbslöh Geisenheim AG):
Practical experiences with FloraClair®**



Karl-Heinz Kubach and Kay-Uwe Lührs explained the right way to use Flora-Clair® fining agent.

The latest trend for vegan clarification of beverages, particularly fruit juices, is gaining more and more ground in processing firms' practices. Processing ingredients have to be changed to access new sales channels and groups of customers with widely differing product requirements. In the process, it is necessary to adjust decades of experience and working methods to adapt to the new processing methods.

There are some parameters which must be adhered to for successful production of pure and stable fruit juices using vegan fining agent Flora-Clair®. The right choice of fining partner is important. An acid colloidal silica, like Klar-Sol Super, is highly suitable. Tannivin® Galléol produces even better results as a reaction partner for FloraClair®, especially where coloured fruit juices are concerned.

A different sequence – FloraClair® >Tannivin® Galléol >Blancobent UF – also has certain advantages. This sequence ensures a long contact time with the plant-based fining agent, as this is added during enzymation. This parameter is particularly important! If the starch and pectin

test results are negative, subsequent addition of Blancobent UF significantly reduces the production and set-up time. Fine flocculation sets in and leads to a small, compact sediment deposit. Because FloraClair® is added in suspension it is virtually impossible to cause overfining. There are no further obstacles to production of a pure, stable fruit juice, in order to be able to economically produce a product that is highly regarded in the market.

**Dr. Eric Hüfner (Erbslöh Geisenheim AG):
Enzymatic options for improving aroma**



Dr. Eric Hüfner explained the use of aroma enzymes taking winemaking as an example.

The use of "aroma enzymes", known as glycosidases, has long been established in wine making. These enzymes release volatile aromatic substances from residual sugars, which can therefore be smelled and tasted. Not just grapes, but almost all fruit, contain these precursor molecules. Aroma enzymes can therefore be used to release the aroma store during many stages of fruit processing.

A wealth of information which packed a punch

was how attendees summed up the seminar. Director, Business Unit Fruit Dr. Robert Könitz expressed his considerable satisfaction. "We put together a great event and are very pleased that it attracted such great international interest." This event is scheduled to be held again in 2020.



drinktec.com

September 11–15, 2017
Messe München, Germany

To all exhibitors: Join the drinktec 2017 PREVIEW

deadline **FRUIT PROCESSING print 7-2017: 30.06.2017**

deadline **FRUIT PROCESSING digital 8-2017: 01.08.2017**

Simply send your related press release and advertisement to:
cornelia.hebbe@confructa-medien.com

Global cold pressed juice market to reach US\$ 845 Million in value by 2024-end

Commercial extraction of pulp or juice directly from fruits, vegetables and other agricultural produce has become easier due to the advent of cold-press technology. The temperate pressure applied on produce during a cold-pressed process not only helps in extracting a fine blend of juice and pulp, but also improves the quality of extract. Consumers from around the world are being acquainted with the fact that cold-pressed juices & pulps are healthier and beneficial than conventionally-grinded fruit extracts.

A recent study conducted by Persistence Market Research estimates that the global sales of cold-pressed juices in 2016 brought in about US\$ 492 million in revenues. The study also predicts that by 2024, the global market for cold-pressed juices will have soared at 7 % CAGR to be valued at US\$ 845 million.

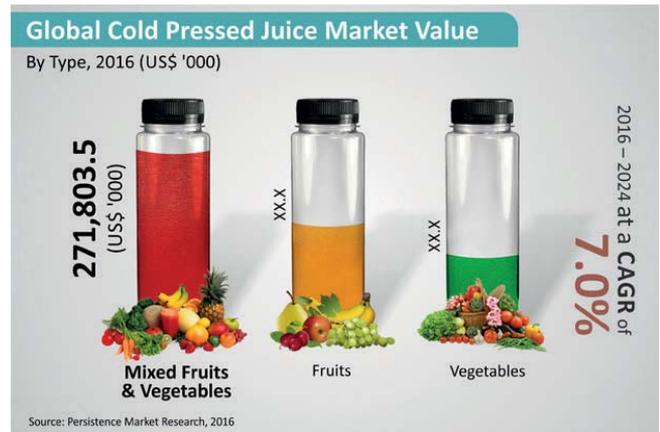
According to the report, titled “Cold Pressed Juice Market: Global Industry Analysis and Forecast, 2016-2024,” Persistence Market Research projects that adoption of cold-press technology has gained traction in the US and Canada. In 2016, sales of cold-pressed juices in North America accounted for more than one-third of global revenues. By the end of 2024, North America’s cold-pressed juice market is anticipated to be valued over US\$ 311 million. Consumption of cold-pressed juices in Europe is also expected to grow rapidly during the course of projection period. Through 2024, Europe’s cold-pressed juice revenues will have soared at a CAGR of 7 %. Latin America and Middle East & Africa are two regions which are likely to incur moderate revenue growth, while contribution of Asia-Pacific to global cold-pressed juice market revenues will witness a bordering decline over the forecast period.

Leading cold-pressed juice makers in world

Pepsi Co., the beverage behemoth, partakes in the global market for cold-pressed juices by offering its flagship product line – the Naked Pressed juices. Along with Pepsi, several other New York-based companies are observed to be key players in the global cold-pressed juice market. These include, Liquiteria LLC., Evolution Fresh, Inc., Juice Press, Hain BluePrint, Inc., and Juice Generation. Additionally, global demands for cold-pressed juices are also being met by beverage makers such as Juice Warrior (UK), Presha Food (Australia), RAW Pressery (India) and Suja Life LLC (US).

Trending – organic cold-pressed juices from mixed fruits & vegetables

The report indicates that in 2017 and beyond, the global demand for cold-pressed juices will remain largely



(© Persistence Market Research)

inclined towards their organic nature. Conventional nature of cold-pressed juices will gradually lose out to the surging popularity of organic cold-pressed juices. By accounting to nearly three-fourth of global revenues, the global sales of organic cold-pressed juices will have raked in revenues worth over US\$ 630 million by the end of 2024. Based on the type of produce, more consumers are opting for cold-pressed juices derived from mixed fruits & vegetables. The combined nutrition availed from a mix of fruits & vegetables treads along global health trends that strongly impact the choice of consumers.

In 2016, more than US\$ 130 million worth of fruit-based cold-pressed juices were sold globally, while revenues from global sales of vegetable-based cold-pressed juices reached US\$ 85 million. However, cold-pressed juices extracted from mixed fruits & vegetables will continue to account for major chunk of global revenues, procuring nearly half a billion dollars by the end of 2024.

Online e-tailing platforms boost sales of cold-pressed juices

While retail stores are predominantly the largest distribution channels for cold-pressed juices, internet selling is also playing an instrumental role in boosting global sales. Through 2024, retail and grocery stores will account for around US\$ 300 million in global revenues, but sales of cold-pressed juices will be the fastest through online e-tailing platforms. Global revenues harvested from selling cold-pressed juices over the internet will register a 7.4 % CAGR. Hyper market or supermarkets will also be one of the dominant distribution channels for cold-pressed juices. Convenience stores, on the other hand, will lose a considerable share of global cold-pressed juices revenues over the forecast period.

Hanovia helps Cott Beverages keep its production process pure



Hanovia's PureLine UV range is an intelligent system that is optimised for the beverage industry.

(© Hanovia)

In an increasingly regulated and safety-conscious market, legislation such as the EU Directive for Bottled Water 98/88/EC (1998) drives the beverage industry to meet ever more stringent standards of quality. Microbial growth due to contaminated water or ingredients can cause discolouration, off flavours and shortened shelf-life. The threat of contamination is further increased as manufacturers respond to demands for less chemical additives and preservatives. Effective microbial disinfection of the whole process is therefore essential.

To meet this requirement, Cott Beverages has been using Hanovia UV disinfection technology to treat process water used in the production process. The company decided to

use UV technology to ensure final product security prior to mixing and bottling and has been very satisfied with the performance of the UV systems.

Hanovia's PureLine UV is an intelligent system that is optimised for the beverage industry to simplify the treatment of water, sugar syrup, brine and even reducing chlorine and ozone. Critically, there are no micro-organisms known to be resistant to UV – this includes pathogenic bacteria such as listeria, legionella and cryptosporidium (and its spores, which are resistant to chlorination). Unlike chemical treatment, UV does not introduce toxins or residues into process water and does not alter the chemical composition, taste, odour or pH of the fluid being disinfected.

UV is used for both primary disinfection or as a back-up for other purification methods such as carbon filtration, reverse osmosis or pasteurisation. Because UV has no residual effect, the best position for a treatment system is immediately prior to the point of use. This ensures incoming microbiological contaminants are destroyed and there is a minimal chance of post-treatment contamination.

UV disinfection systems are easy to install, with minimum disruption to the plant. They need very little maintenance, the only requirement being the replacement of the UV lamps every 9-12 months, depending on use. This is a simple operation that takes only a few minutes and can be carried out by trained general maintenance staff. Hanovia's UVCare™ training programme supports businesses like Cott Beverages to make sure servicing is carried out by certified engineers.

PepsiCo joins New Plastics Economy Initiative as Core Partner

PepsiCo has joined the New Plastics Economy initiative as a Core Partner, signaling the global food and beverage company's continued commitment to reduce packaging waste.

Led by the Ellen MacArthur Foundation, the New Plastics Economy is bringing together industry, government, NGOs, scientists, students and citizens to build a more sustainable global plastics value chain.

PepsiCo's participation in the initiative supports the company's previously announced goals to strive for 100 % of its packaging to be recoverable or recyclable by 2025 and to partner to increase packaging recovery and recycling rates. These goals are part of PepsiCo's Performance with

Purpose vision to deliver top-tier financial performance over the long run by integrating sustainability into its business strategy.

"PepsiCo is committed to taking aggressive action to promote sustainability within our direct operations, while also acting far beyond our own walls through collaboration with others," said Mehmood Khan, PepsiCo's Vice Chairman and Chief Scientific Officer of Global Research and Development. "Unlocking new packaging material innovation and increasing consumer recycling rates requires strong partnership across the public and private sectors. The New Plastics Economy initiative is an important step towards creating a more sustainable packaging ecosystem and we are delighted to be a core partner."

Trouble-free recycling: Nature MultiPack™ granted interim approval by the EPBP

Following tests on the Nature MultiPack™ the European PET Bottle Platform (EPBP) has confirmed that it can be fully recycled. The adhesive specially developed and supplied by NMP Systems and KHS has thus been granted interim approval for further market tests in Europe until June 30, 2019. The adhesive on the unique Nature MultiPack™ packaging system has no adverse effect on the rPET. Further tests shall be run to enable permanent approval to be granted.

As a form of packaging for PET bottles which does not require any visible secondary film packaging, Nature MultiPack™ attracted much attention during its presentation. The PET bottles are held together by dots of adhesive; there is thus no film obstructing the view of the bottle. In 2016 the system won the German Design Award for outstanding communication design and sustainable packing. Considerable savings in materials and practical handling distinguish the pack from all other existing packaging

variants. With the interim approval granted by the EPBP an independent body has now also confirmed that in tests the specially developed adhesive for the dots of glue on the bottles has no negative impact on the quality of the recycled PET.



Nature MultiPack™
(© KHS)

The tests showed that the dots of adhesive are removed as intended by friction during the washing process. The adhesive is then separated from the PET flakes as it floats to the surface of the cleaning medium. EPBP's interim approval is valid until June 30, 2019. Further tests which are to culminate in the issue of permanent approval will follow in the coming months.

A new method for producing plant-based drinking bottles from FDCA

VTT Technical Research Centre of Finland has developed an environmentally sound and economical method for producing furan dicarboxylic acid (FDCA) from plant sugars for the production of drinking bottles, paints and industrial resins, for example. This technology enables production of plant-based products.

The main production material of drinking bottles is still oil-based PET although there has been news on alternatives based on renewable materials during the last few years.

VTT's new method provides a new route for the packaging and beverage industries to expand the use of renewable materials in their production.

VTT has patented the method for producing furan dicarboxylic acid (FDCA), the monomer for PEF polymers, from sugar or sugar waste. Thanks to the solid acid catalyst and biobased solvent with short reaction time, the method provides a considerable reduction of toxic waste compared to traditional methods.

Magnoni Table Top: handling and flexibility

The handling of full or empty containers has no limits: Magnoni has presented Table Top, a system to handle bottles, tanks, cartons, trays, bundles, buckets, cans and jars, which can take place on one or more ways with different methods, according to the needs.

The company, which has been on the most important international markets with customized handling systems for the food industry for over 60 years, has implemented a technology that can meet the different demands of the industry, focusing on high flexibility and proved quality.



With Table Top, the handling of full or empty containers reaches the maximum flexibility.
(© Magnoni)

The application is useful to handle containers on one or more ways, in bulk, build-up or separate, using acetal or stainless steel chains with different thicknesses depending on the type of containers to be handled.

The line, made in stainless steel with derlin and high-density polyethylene runners and chains, as well as acetal and stainless steel and chain lubrication systems, is composed of 1 to 20 ways conveyors, sweep-off aligners and pressure-less aligners, slowing down tables and accumulation tables.

Australian Entrepreneur Finds Billion-Dollar Niche in U.S. Beverage Market

Australian single mother of three releases “Aussie Cordial,” a healthy new family-friendly drink set to revolutionize the beverage industry



Aussie Cordial Raspberry
(© Aussie Cordial Co.)

The Aussie Cordial Company advised it is launching a range of true “healthy” alternatives to the mostly sugar-laden drinks sold in the. Aussie Cordial is a healthy new fruit flavored concentrate with no artificial color or flavor, no added sugar and no calories. It is made in the U.S.A., comes in a cool new 2-liter bottle, adorned with a kangaroo called Boomer that is sure to become a household name across the U.S.A.

Founder and CEO Kim Johnston says, “I grew up with cordial in Australia and was shocked when I arrived in the U.S.A. in 2006, to discover that no one had ever heard of it! I was going to import the Australian cordial, but I wasn’t happy with the unhealthy ingredient choices. So I decided to create my own healthy formula. I am super excited to release this outstanding product in the U.S.A. Aussie Cordial does not promote tooth decay, nor does it affect blood glucose, making it a really good choice for pre-diabetics and diabetics.”

Aussie Cordial is firmly committed to its corporate responsibilities regarding the environment. As well as the health and taste benefits, Aussie Cordial, being a concentrate (mixed with a 1:9 ratio with water) is nine times more environmentally responsible in comparative manufacturing, packaging and transport impact than standard soda

Cordials

A cordial is concentrated fruit-based syrup. In the undiluted state the syrup is very sweet, so it is designed to be mixed with predominantly with water (for example tap water, bottled water or soda water). It can be diluted in any amount to fit the taste of the consumer, normally at a ratio of one part cordial to four or five parts water. Cordials are popular throughout Australia, and come in a variety of flavours, including orange, lemon, blackcurrant, and lime, but vary according to the market in which they are sold. Cordials may or may not contain juice and/or sugar. Like any beverage, cordials should be used in moderation as part of a balanced diet.

As with other non-alcoholic beverages, cordials provide a daily intake guide which dictates the proper serving size as well as the percent of daily intake the ingredients in the product account for. All cordials will also clearly state the mixing ratio of cordial to water as a recommended concentration.

Source: Australian Beverages Council Ltd

drinks. Each bottle provides over 100 servings, making it also far more economical than sodas.

Aussie Cordial has no added sugar, no artificial color or flavor and no calories; it is a concentrate that is mixed in a 1 part cordial, 9 parts water combination. It comes in eight new flavors – Apple & Black Currant, Green Apple, Raspberry, Lemon, Watermelon, Blueberry, Kiwi and Orange/Passionfruit. Aussie Cordial is headquartered and manufactured in Las Vegas, Nevada. Aussie Cordial will soon be available in grocery stores across the U.S.A.

Discover more daily business news
and subscription options:
www.fruit-processing.com

BUSINESS CONTACTS

BUCHER
unipektin

Bucher Unipektin AG
Murzlenstrasse 80
CH-8166 Niederweningen
Phone +41 44 857 23 00
Fax +41 44 857 23 41
info@bucherunipektin.com
www.bucherunipektin.com

**Hydraulic Filter Press, Micro- & Ultrafiltration,
Adsorbers, Evaporators**

Bucher Unipektin AG is leading supplier of plants and components for the production of fruit juice and purees. In addition we are recognized supplier of sludge-dewatering plants and vacuum drying units. Recently we started the supply of evaporators for the dairy-industries and equipment for citrus-production.

centrimax[®]

Winkelhorst Trenntechnik GmbH
Kelvinstr. 8
50996 Cologne
Phone: +49-2236-393530
Fax: +49-2236-393559
info@centrimax.com
www.centrimax.com

**Disc Stack Centrifuges and Decanters
Used – Fully Reconditioned – Warranty**



Disc stack centrifuges and decanters from
GEA Westfalia Separator, Flottweg, Alfa Laval
– used – fully reconditioned –
– with a Warranty – new PLC Control units –



Flottweg
Separation Technology

Flottweg SE
Industriestrasse 6-8
84137 Vilsbiburg, Germany
Phone +49 (0) 8741-301-0
Fax +49 (0) 8741-301-300
mail@flottweg.com
www.flottweg.com

**Belt Presses, Decanters, and Disc Stack Centrifuges
Solutions for the Production of Fruit and Vegetable Juices**

Flottweg offers customized solutions for higher yields and best quality. Our systems are well-known for high reliability and low operating costs. Due to more than 50 years of experience we have gained considerable know-how in the production of fruit and vegetable juices.



**GfL – Gesellschaft für Lebens-
mittel-Forschung mbH**
Landgrafenstrasse 16
D-10787 Berlin, Germany
Phone: +49 (0)30 263920-0
Fax: +49 (0)30 263920-25
www.gfl-berlin.com
info@gfl-berlin.com

**Residue Analyses for Fruit Juice and Food,
Contract Research**

GfL is one of the world wide leading laboratories in the field of fruit and vegetable juice. We analyse about 15.000 samples per year on adulterations and authenticity. Since 1990 we are additionally active in the analysis of pesticide residues.

AN EYE-CATCHER FOR
YOUR CUSTOMERS



THE BUSINESS CARD OF YOUR COMPANY

Please contact **Cornelia Hebbe**
Phone +49 (0) 2634 9235-16
cornelia.hebbe@fruit-processing.com

FRUIT
PROCESSING

**As of 2017 FRUIT PROCESSING
is published 11 times!**

**Profit from the higher frequency and
enhanced market penetration.**

A Gateway to the C...

Present your com...
FRUIT PROCESSING issue (p...

**Entries can also be
booked monthly for
EUR 125/month!**

BUSINESS CONTACTS – the Buyer's Guide for our readers!

1 Your insertion in **BUSINESS CONTACTS** in
11 consecutive issues (6 print/digital, 5 digital)

Standard advertisement (85 mm wide x 55 mm high), full colour, including logo, address, up to 4 highlighted keywords and space for additional text.

Print & online offer (one year/11 issues)
= 720.– EUR + VAT, if applicable

2 **Linked skyscraper banner on
www.fruit-processing.com**

Banner size: 120 x 60 pixel, linked to your website, for the reduced rate of EUR 90.– per month (regular rate is 150.–)
For 12 months: 12 x 90.– EUR = 1,080.– EUR

Cross media offer (one year/11 issues)

1 + 2 = 1,800.– EUR + VAT, if applicable

Please contact **Mrs Cornelia Hebbe**: phone +49 (0) 2634 9235-16 or cornelia.hebbe@fruit-processing.com

(Price Information without Liability)

Source: Survey by confructa medien GmbH, from a minimum group of 5 marketers and 5 juice purchasers for each product. Since its first publication in 1991, more than 40 industry partners – manufacturers, traders, processors, bottlers, packers, bankers – have been contributing data.

Your price quotation data, too, is much appreciated. Please forward your contributing input directly to the editorial team c/o christian.friedel@confructa-medien.com

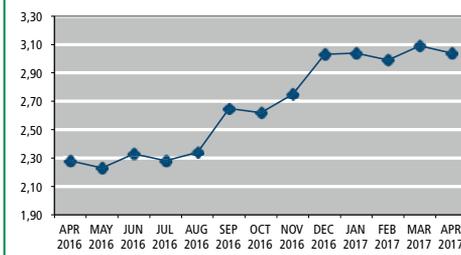
Prices: The price range is calculated for juice or puree of different proveniences, traded in drum or bulk; \$/kg = cif Rotterdam; EUR/kg = DDP

Custom Duties: The range encompasses preferential duties up to 30 %

◆◆ This line represents the development of the mean values (excepted graph 'orange juice concentrate – future markets')

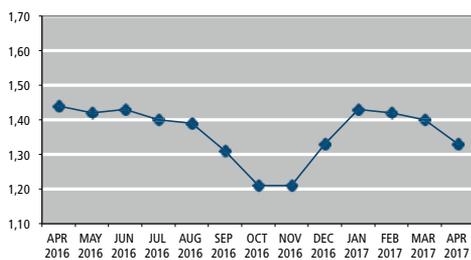
Orange Juice Concentrate

65 °Brix, \$/kg



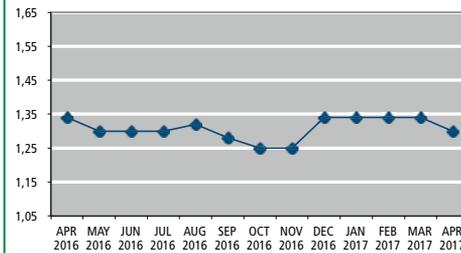
Apple Juice Concentrate

70 °Brix, high acidity, EUR/kg



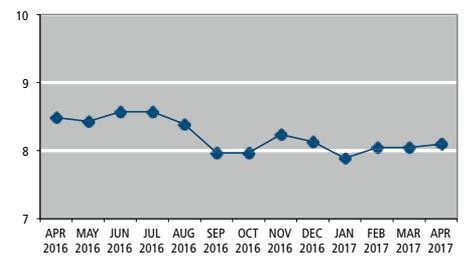
Apple Juice Concentrate

70 °Brix, low acidity, EUR/kg



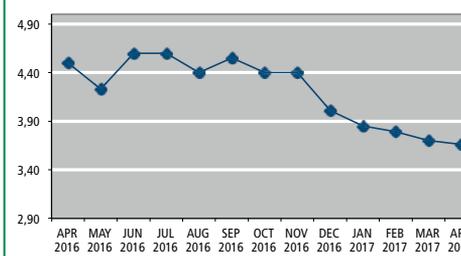
Passion Fruit Juice Concentrate

50 °Brix, \$/kg



Pineapple Juice Concentrate

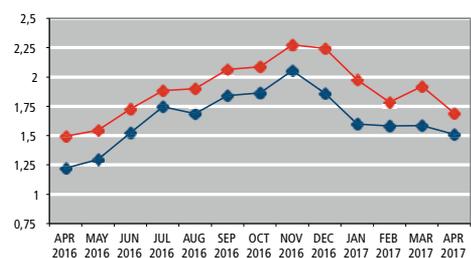
65 °Brix, \$/kg



Orange Juice Concentrate

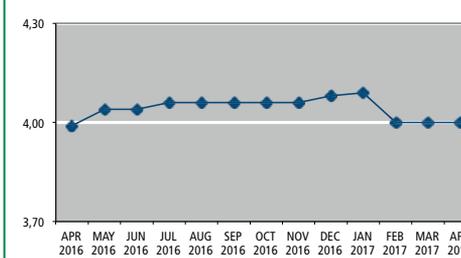
Future Markets \$/lb.

◆◆ = highest values
◆◆ = lowest values



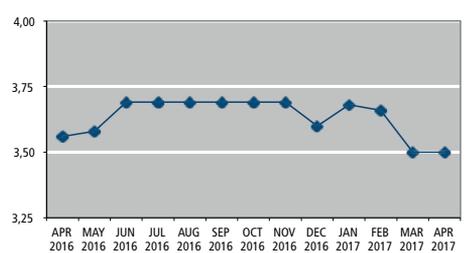
Lemon Juice Concentrate

cloudy, 400 g/l acid, \$/kg



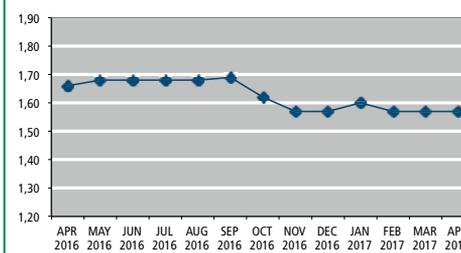
Grapefruit Juice Concentrate

58 °Brix, \$/kg



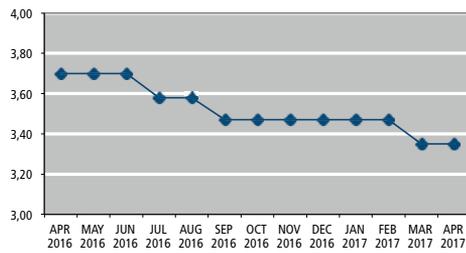
Pear Juice Concentrate

65 °Brix, EUR/kg



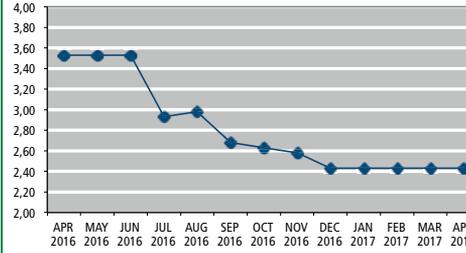
Sour Cherry Juice Concentrate

65 °Brix, EUR/kg



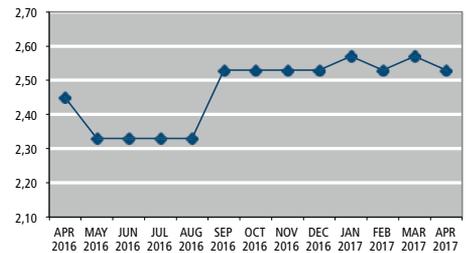
Black Currant Juice Concentrate

black, 65 °Brix, EUR/kg



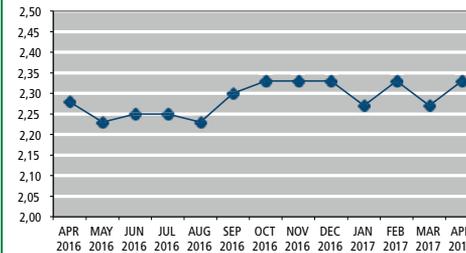
Grape Juice Concentrate

white, 65 °Brix, EUR/kg



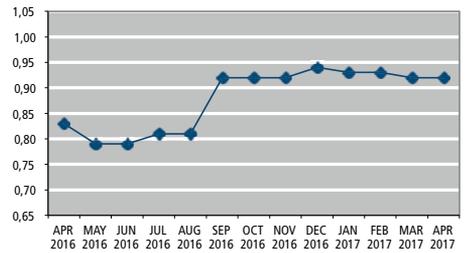
Grape Juice Concentrate

red, 65 °Brix, EUR/kg



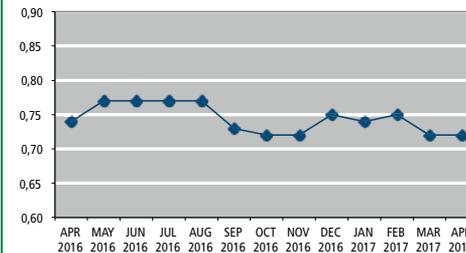
Apricot Puree

EUR/kg



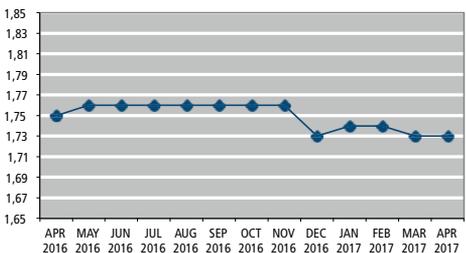
Banana Puree

22-24 °Brix, \$/kg



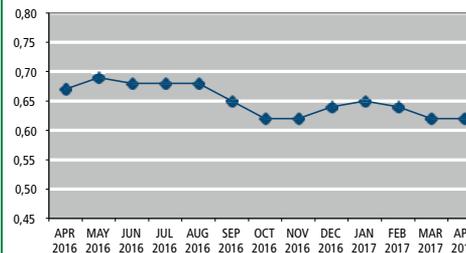
Mango Puree

15 °Brix, \$/kg



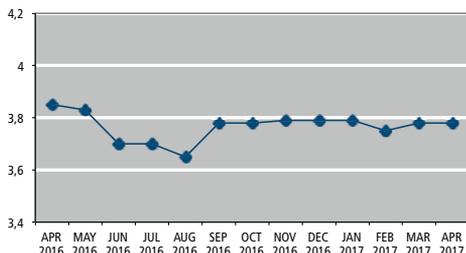
Peach Puree

EUR/kg



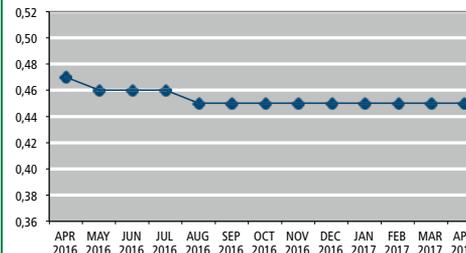
Carrot Juice Concentrate

65 °Brix, EUR/kg



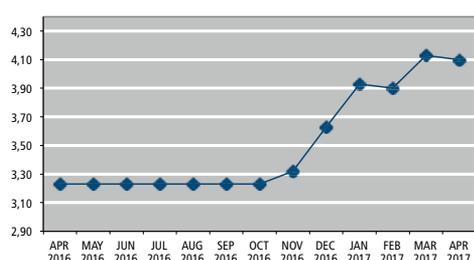
Carrot Juice

EUR/l



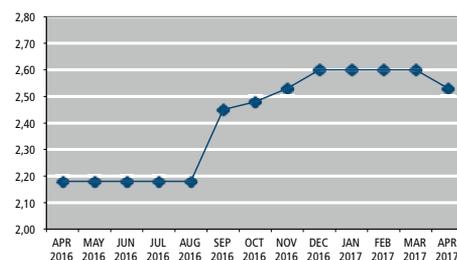
Orange Juice Concentrate

organic, 65 °Brix, \$/kg



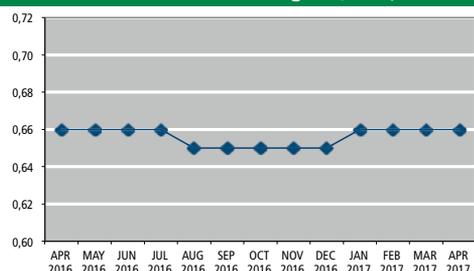
Apple Juice Concentrate

organic, high acidity, 70 °Brix, EUR/kg



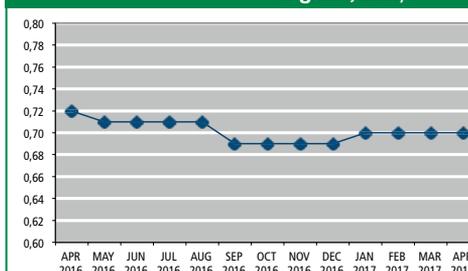
Carrot Juice

organic, EUR/l



Red Beet

organic, EUR/l



Print and online edition available! Have a look at
www.fruit-processing.com
 New website coming soon!



PEER REVIEW BOARD

New members welcome – please apply by sending an email to editorial@fruit-processing.com

Permanent Members:

- Dr Victor ARA, Chelab, Hemmingen, Germany
- Prof Dr Reinhold CARLE, Hohenheim University, Germany
- Prof Dr Helmut DIETRICH, Geisenheim University, Germany
- Mikko HOFSSOMMER, GfL, Berlin, Germany
- Prof Tilo HÜHN, Wädenswil University, Wädenswil, Switzerland
- Prof Dr Alessandro NOGUEIRA, Ponta Grossa State University, Brazil
- Dr Stefan PECORONI, GEA Westfalia Separator Group GmbH, Oelde, Germany
- Matthias SASS, Rudolf Wild GmbH & Co. KG, Eppelheim, Germany
- SGF International e. V., Nieder-Olm, Germany
- Dr Joachim TRETZEL, DöhlerGroup, Darmstadt, Germany
- Prof Dr Frank WILL, Geisenheim University, Germany
- Dr Edgar ZIMMER, Bucher Unipektin AG, Niederweningen, Switzerland



WORLD OF FRUIT PROCESSING

Market Data – confrica media GmbH

New Persistence Market Research Study Reveals: Global Cold Pressed Juice Market to Reach US\$ 845 Million in Value by 2024-end

Commercial extraction of pulp or juice directly from fruits, vegetables and other agricultural produce has become easier due to the advent of cold-press technology. The temperate pressure applied on produce during a cold-pressed process not only helps in extracting a fine blend of juice and pulp, but also improves the quality of extract. Consumers from around the world are being acquainted with the fact that cold-pressed juices & pulps are healthier and beneficial than conventionally-grinded fruit extracts.

A recent study conducted by Persistence Market Research estimates that the global sales of cold-pressed juices in 2016 brought in about US\$ 492 million in revenues. The study also predicts that by 2024, the global market for cold-pressed juices will have soared at 7 % CAGR to be valued at US\$ 845 million.

According to the report, titled “Cold Pressed Juice Market: Global Industry Analysis and Forecast, 2016-2024,” Persistence Market Research projects that adoption of cold-press technology has gained traction in the US and Canada. In 2016, sales of cold-pressed juices in North America accounted for more than one-third of global revenues. By the end of 2024, North America’s cold-pressed juice market is anticipated to be valued over US\$ 311 million. Consumption of cold-pressed juices in Europe is also expected to grow rapidly during the course of projection period. Through 2024, Europe’s cold-pressed juice revenues will have soared at a CAGR of 7 %. Latin America and Middle East & Africa are two regions which are likely to incur moderate revenue growth, while contribution of Asia-Pacific to global cold-pressed juice market revenues will witness a bordering decline over the forecast period.

Leading Cold-Pressed Juice Makers in World

Pepsi Co., the beverage behemoth, partakes in the global market for cold-pressed juices by offering its flagship product line – the **Naked Pressed** juices. Along with Pepsi, several other New York-based companies are observed to be key players in the global cold-pressed juice market. These include, **Liquiteria LLC.**, **Evolution Fresh, Inc.**, **Juice Press**, **Hain BluePrint, Inc.**, and **Juice Generation**. Additionally, global demands for cold-pressed juices are also being met by beverage makers such as **Juice Warrior (UK)**, **Presha Food (Australia)**, **RAW Pressery (India)** and **Suja Life LLC (US)**.



(Source: Persistence Market Research – 2017)

FRUIT PROCESSING offers all you need to know about fruit processing innovation and trends around the world and interprets them to help you improve your business.

11 times a year!

The new subscription options:

Choose yours today...

BASIC FRUIT PROCESSING

- ✓ 6 print issues of FRUIT PROCESSING a year, shipped worldwide
- ✓ 5 additional digital issues a year
- ✓ **Juicy News** weekly e-newsletter



* price is valid for Europe incl. p+h, + VAT if applicable
Overseas: € 124 incl. p+h

DIGITAL FRUIT PROCESSING

- ✓ 6 digital issues of FRUIT PROCESSING a year
- ✓ 5 additional digital issues a year
- ✓ **Juicy News** weekly e-newsletter
- ✓ online archive accessible for last 12 months prior to the start of subscription period



PRO FRUIT PROCESSING

- ✓ 6 print issues of FRUIT PROCESSING a year, shipped worldwide
- ✓ 6 digital issues a year
- ✓ 5 additional digital issues a year as of 2017
- ✓ **Juicy News** weekly e-newsletter
- ✓ FULL ACCESS to **complete** online archive since 2002!



* price is valid for Europe incl. p+h, + VAT if applicable
Overseas: € 184 incl. p+h