ISSCT Engineering Workshop 2008
Design, manufacturing and maintenance of sugar mill equipment

Summary report

by

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ISSCT Engineering Section Chairman

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ISSCT Engineering Workshop 2008
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Summary report

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Summary report

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The ISSCT Engineering Workshop 2008 in Brazil was well attended with 62 participants including 39 overseas visitors from 15 countries.

The workshop addressed the theme *Design, manufacturing and maintenance of sugar mill equipment*. From the technical sessions, the following conclusions were drawn:

- Several speakers articulated a shared vision of the future of the Brazilian sugar industry. This shared vision gives considerable confidence that the vision can become a reality.
- There is an increased focus on energy products. As a result, the reduction of factory energy consumption in order to maximise the energy available for products is also a focus.
- New equipment and products are being developed with reduced power consumption, lower capital and maintenance costs and better performance.
- Methods presented for reducing maintenance costs included the use of a maintenance management system, condition monitoring and material selection.

The workshop was held in conjunction with Piracicaba's annual SIMTEC exhibition for the sugar and alcohol industries that provides a forum for technical presentations and discussion and showcases products and services from manufacturers and service providers. In return for holding the workshop in conjunction with SIMTEC, SIMTEC provided sponsorship for the workshop, including paying travel and accommodation costs for two invited speakers, and organisation for the workshop. The ISSCT and SIMTEC technical programs were arranged so that their technical sessions did not clash and the ISSCT program was extended a day to provide an opportunity for ISSCT participants to attend the SIMTEC exhibition. Informal feedback from workshop participants suggested that the arrangement between ISSCT and SIMTEC worked well.

Site visits to two manufacturing facilities and two sugar mills were arranged as part of the workshop.

ISSCT Engineering Workshop 2008
Design, manufacturing and maintenance of sugar mill equipment

Summary report

1. Introduction

An ISSCT Engineering Workshop was held in Piracicaba, Brazil from 30 June to 4 July 2008. The theme of the workshop was *Design, manufacturing and maintenance of sugar mill equipment*.

The workshop was held in conjunction with SIMTEC (Symposium and Technology Exhibition on the Sugar & Alcohol Industry). SIMTEC is an annual event held in Piracicaba that provides a forum for technical presentations and discussion and showcases products and services from manufacturers and service providers. SIMTEC provided sponsorship for the ISSCT workshop and handled most of the workshop organisation. A brief overview of SIMTEC is presented in Appendix A.

To better integrate with SIMTEC, the ISSCT workshop was extended from its usual four days to five days. Technical sessions were held throughout the first day and on the mornings of the second and third days. SIMTEC started on the second day of the workshop and continued until the final day. SIMTEC was held in the afternoons and evenings of the second and third days so it did not clash with the workshop technical sessions. The afternoon programs for the second and third days of the workshop were kept free for SIMTEC attendance so that ISSCT participants could attend the SIMTEC technical sessions and trade exhibition. Site visits were held on the fourth and fifth days of the workshop. The detailed workshop program is presented in Appendix B.

The workshop was attended by a total of 62 participants, including 39 overseas visitors from 15 countries. A full list of the participants is presented in Appendix C. Attendance included the ISSCT Factory Commissioner, Juliusz Lewinski; the author (Geoff Kent, ISSCT Engineering Section Chairman); and five members of the ISSCT Engineering Section Committee - Paulo Delfini, D.K. Goel, Adolfo Gomez, Dave Meadows and Boris Morgenroth. Paulo Delfini from Brazil acted as Chairman of the Workshop Organising Committee in the lead up to the workshop while the other four members of the committee in attendance chaired the four main technical sessions.

2. Sponsorship

Financial support for the workshop was provided by SIMTEC, Dedini, TGM and WBA. In addition to the support provided in organising the workshop, SIMTEC paid the travel and accommodation costs for two invited speakers: Mr Alan Yarrow of Australia and Mr Manuel Enríquez of Mexico. TGM and Dedini provided lunch for the delegates during the two days of site visits.

Zuckerindustrie and International Sugar Journal provided a free one-page advertisement in their respective journals in advance of the workshop.

3. Opening session

The opening session of the workshop, chaired by the author, included presentations from the following invited speakers:

- A welcome from Paulo Delfini, the Chairman of the Workshop Organising Committee.
- The official opening of the workshop by José Francisco Calil, the Secretary of Economic Development for the City of Piracicaba.
- An overview of the sugar industry in Brazil by Edgard Gomes Beauclair of STAB.
- A welcome to SIMTEC from Alvaro Vargas, Directory of Industry Centre of Sao Paulo State (CIESP).

Edgard Beauclair's presentation provided a good overview of the sugar industry in Brazil and its vision for the future. He stressed that the industry has been unfairly subjected to international criticism due to two misconceptions:

1. The production of ethanol from sugarcane is not replacing food production. Most new cane land was previously unproductive.
2. New cane land is not within the Amazon region of Brazil.

The Brazilian industry is focussed on the use of sugarcane as an energy crop. Products include ethanol from juice products, electricity, biodiesel and ethanol from sugarcane biomass.

4. Technical sessions

4.1 Introductory remarks

The conference included four technical sessions. The session topics and their respective chairmen are listed in Table 4.1. Each session contained a keynote address that was intended to lead into a discussion of that topic. The keynote speakers are also listed in

Table 4.1. Additional technical presentations were also given. The detailed program is presented in Appendix B.

Table 4.1 Session topics and chairmen

Topic	Chairman	Keynote speaker
Factory and factory system design and maintenance	Dave Meadows, Tongaat Hulett, South Africa	José Luiz Olivério, Dedini, Brazil
Factory equipment design and manufacture	Boris Morgenroth, IPRO, Germany	Boris Morgenroth, IPRO, Germany
Factory equipment maintenance	D.K. Goel, ISGEC John Thompson, India	Alan Yarrow, ISS-Machine Health, Australia
Novel and unconventional equipment designs	Adolfo Gomez, Cenicaña, Colombia	Dave Meadows, Tongaat Hulett, South Africa

Four topics were submitted for presentation but were not presented. Three of these presentations were supplied by Mr Alan Yarrow of Australia as extra material to be presented if time permitted. The final paper was supplied by Ulka Industries of India but no representatives were able to attend (they sent an apology).

4.2 Factory and factory system design and maintenance

4.2.1 Keynote address: Factory and factory system design (José Luiz Olivério)

José Olivério outlined Dedini's view for the evolution of the sugar industry in Brazil, focusing on sustainable development by producing biofuels and bioenergy from sugarcane. He described traditional factory configurations, current trends and a future vision.

The traditional factory configuration in Brazil produces sugar, bioethanol and bioelectricity. To maximise energy output, there is a need to minimise factory energy consumption. A traditional factory can maximise energy output by replacing turbine drives with electric or electro-hydraulic drives, generating high pressure (100 bar) steam, producing low, low pressure steam, improving process control and biodigestion of dunder.

Considered as an energy source, one tonne (dry basis) of cane in the field (made up of one-third sugar, one-third bagasse and one-third trash) has equivalent energy to 1.2 barrels of oil. Bioelectricity can be produced from bagasse, trash and dunder. Bioethanol can be produced from bagasse and trash. Biodiesel can be produced from an integrated sugar and bioethanol mill. He outlined a range of technologies under development that would help to achieve this vision.

The presentation also covered environmental sustainability and the need to reduce water consumption. His vision included the export of water and the production of fertilizer from concentrated dunder and filter mud.

4.2.2 On line devices for process monitoring and control of the sugar production – the purity analyzer (Mathis Kuchejda)

Mathis Kuchejda indicated that the demand for on-line instrumentation came from the desire to maximise productivity through direct process control. On-line instrumentation is of great benefit in process control.

The on-line purity analyser measures purity according to the ICUMSA laboratory method. It consists of a process refractometer for measuring brix and an NIR polarimeter polatronic for measuring pol. The NIR method does not require the juice to be clarified before measurement. The analyser can be used on process streams with brix from 15 to 85. Higher brix materials are diluted by a factor of four before measurement.

The instrument takes about ten minutes to process a sample. It is intended that samples from multiple streams be processed by this one instrument. The system is cleaned as part of the measurement cycle in readiness for processing a different stream.

4.3 Factory equipment design and manufacture

4.3.1 Keynote address: Factory equipment design and manufacture (Boris Morgenroth)

After listing a range of emerging technologies for sugar mill equipment, Boris Morgenroth focussed on evaporator designs. He discussed the evolution of the evaporator, with falling film plate evaporators being the most recent type to gain acceptance. He indicated that this type of evaporator offered better heat transfer coefficients and less sucrose inversion but required higher juice velocities.

4.3.2 Concept for an energy efficient 6000 t/day cane sugar factory (Boris Morgenroth)

Boris Morgenroth described a range of technologies that he believed should be incorporated into a new cane sugar factory in order to achieve high energy efficiency. The technologies he recommended were:

- Diffuser technology and the return of clarifier underflow to the diffuser.
- Falling film plate evaporators.
- Increased fifth effect vapour temperature from 0.15 bar(a) to 0.55 bar(a).
- Vapour bleeding from all effects.
- All pans supplied with vapour 3 (about 100 °C).
- Continuous pans for A, B and C products.
- A-seed cooling massecuite plant.
- A-syrup wash for A-sugar.
- Stepwise flashing of condensates and reuse of flash vapours.
- Using condensate for pre-heating of limed juice.
- High g-factor continuous centrifugals.
- High pressure boiler and turbo-alternator.
- High level of automation.

4.3.3 *Simple innovative, proven equipment and processes for improving energy efficiency in sugar factories (Bruce Moor)*

Bruce Moor discussed a range of relatively simple changes that could be made to an existing factory to improve energy efficiency. His baseline for improvement was a typical co-generating factory considered efficient in the 1980s. The technologies he discussed were:

- High steam pressure and temperature boilers.
- Continuous pans using vapour 2 or vapour 3.
- Diffusers.
- Mud recycling to diffuser.
- Electric drives on shredder and mills.
- Boilers with increased boiler efficiency (better air heaters and economisers) and less excess air.
- Direct contact heaters.
- Long tube rising film evaporators, particularly for first and second effects.

4.3.4 *Design, manufacturing and maintenance of sugar mill equipment (Simon Trancart)*

Simon Trancart reported on a range of designs available from Fives Cail aimed at reduced maintenance costs and higher energy efficiency. These designs were:

- The in-line shredder which contains no knives and reduces power consumption by 15% to 20% as a result.
- The MillMax three-roll mill configuration that achieves 12% lower capital cost, 40% lower maintenance cost and 30% lower power consumption than an equivalent four-roll mill.
- A falling film tube evaporator that achieves high heat transfer coefficients, low residence time and low temperature drop.
- Two designs of continuous vacuum pan (one with vertical tubes and one with horizontal tubes) that can operate on vapour 2 or vapour 3, with low temperature drops.
- Batch centrifugals that consume 30% to 40% less power than earlier designs.

4.3.5 *Main results of the application of planetary gear boxes to drive cane sugar mills (Paulo Rogério Vizin)*

TGM have developed a range of planetary gearboxes for mills than enables in-line roll drives. The drives have been used to completely replace turbines or to provide *assist* drives to increase mill power through providing additional power on one roll. They can also be used to replace conventional gearing on turbine driven mills. The planetary gearboxes are more efficient than traditional mill gearing.

4.3.6 Characteristics of the Mexican industrial sugar plant – some innovations introduced (Manuel Enríquez Poy)

Manuel Enríquez outlined a range of technologies being introduced into the Mexican sugar industry to improve factory performance. These technologies were:

- 35 t trucks for cane transport.
- Heavy duty shredders.
- Hydrostatic mill drives and rope couplings instead of tailbars.
- Automatic roll arcing, including the pre-season application of picots for increased grip.
- Increased automation of the factory.
- Rotary juice screens.
- Bagasse bins.
- Automatic bagasse feeders for boilers.
- Higher pressure boilers.
- Low residence time clarifiers.
- Plate juice heaters.
- Pan automation.
- Continuous vacuum pans.
- Vertical crystallizers.
- Larger batch and continuous centrifugals.
- Cane separation for separate processing of pith and rind.
- Alcohol distilleries.
- Molasses storage in underground plastic liners.
- Liquid sugar and amorphous sugar.
- Bulk sugar road transport.

He also outlined a vision for a future mill that included ethanol production, cogeneration, use of vinasse for irrigation and mill mud for composting.

4.3.7 Computational modelling for the design of sugar mill equipment (Geoff Kent and Ross Broadfoot)

Geoff Kent and Ross Broadfoot provided a range of examples where the use of computational fluid dynamics had been used to improve the design of sugar mill equipment. Specific examples included:

- Boilers.
- Juice clarifiers.
- Robert evaporators.
- Syrup clarifiers.
- Batch and continuous vacuum pans.

4.3.8 Development of pinionless mill for energy efficiency and low maintenance (D.K. Goel)

ISGEC John Thompson has developed a range of pinionless mills for up to 340 t/h cane rate. D.K. Goel outlined the design steps in developing the design and some of the design features of the mill.

The design included finite element analysis of the headstock, bearings and top roll assembly. The pinionless drives result in lower stresses in the components than in a conventional four-roll mill. Other advantages include 15% lower cost, 15% lower power consumption, reduced lubricant consumption, more even top roll lift and reduced maintenance costs. One feature of this design is that the electric motors are vertically mounted to reduce the bending moment on the top roll shaft.

4.3.9 Design, manufacturing and maintenance of electro-hydraulic drives (Bo Ljung)

Bo Ljung described the characteristics of the electro-hydraulic drive. The drive has good speed control and full torque available over the entire speed range, up to the limit of the electric motor. The maximum torque is determined from the size of the motor and the allowable hydraulic pressure. The maximum speed is determined from the capacity of the hydraulic pump.

Hydraulic motors have application in sugar mills as mill drives, conveyor drives, crystalliser drives and winch drives.

The drive features and maintenance requirements were described.

4.3.10 High pressure cogeneration in sugar plants (A.K. Subramanian)

A.K. Subramanian outlined the features of the high pressure boilers available from ISGEC John Thompson. He indicated that 32% higher power generation per tonne of bagasse could be achieved by increasing the boiler pressure from 45 bar to 105 bar.

The main features of the high pressure boiler are:

- Pressurised feedwater (220 °C).
- Travelling grate to handle alternative fuels such as coal and woodchip.
- Electrostatic precipitators.
- On-line steam and water analysers.

In increasing the boiler pressure from 65 bar to 105 bar, the capital cost of a boiler increases by only 10%, due to the need to only change the design of the pressure parts. All boilers with a pressure greater than 45 bar require a dedicated water circuit.

4.3.11 Efficient cooling crystallization – design and practice (Reinhold Hempelmann)

Reinhold Hempelmann described BMA's oscillating vertical crystallizer design. The main feature of this design is that the cooling banks within the crystalliser move up and down by 1 m due to the action of hydraulic cylinders. This movement increases heat transfer and improves the flow of high-viscosity massecuite. The crystallizer achieves plug flow, resulting in a well defined and consistent residence time.

4.3.12 Selection, use and maintenance of process pumps in sugar industry (Michael Yang)

Michael Yang described the selection criteria that should be used to select a centrifugal pump to minimise whole-of-life costs. These criteria include:

- Selection of the pump material and shaft sealing arrangement.
- Pumping efficiency (energy use).
- Maintenance costs.
- Quality.

Capital costs are only a significant part of whole-of-life costs for small pumps (less than 10 kW). Capital costs are almost negligible for pumps over 150 kW. Given the relative significance of maintenance costs in the whole-of-life costs, stainless steel pumps with dynamic seals were recommended in most applications.

4.4 Factory equipment maintenance

4.4.1 Keynote address: Condition monitoring (Alan Yarrow)

The purpose of condition monitoring is to achieve a reduction in maintenance costs by only maintaining equipment that needs to be maintained. It assists to identify potential failures before they fail in order to reduce the incidence of breakdowns.

Alan Yarrow categorises items of plant as critical, moderate or convenient. Failure of critical plant could cause a major loss of production. Failure of moderate plant would cause some loss of production. Failure of convenient plant is not expected to cause a loss of production. The sampling frequency is highest for critical plant and generally only monitored at the end of the season for convenient plant (to determine if an overhaul is required during the maintenance season).

Typical techniques used for condition monitoring are:

- Vibration analysis.
- Oil analysis.
- Grease analysis.
- Use of a magnetic chip collector and filter debris analysis.
- Wear debris analysis.

- Thermography.

4.4.2 Formalising maintenance processes with a traditional Australian sugar milling environment to develop a culture based on improvement (Steve Scott)

Steve Scott outlined the process being undertaken at Harwood Mill in Australia to implement a maintenance management system in order to improve the operation of the plant and to reduce overall maintenance costs.

The process involved:

- Identifying the problems with the current maintenance system that expended all resources on immediate maintenance needs.
- Developing a maintenance management system.
- Formalising the control of maintenance work through work flow control.
- Analysing the effectiveness of maintenance in order to modify maintenance practices to increase the amount of scheduled maintenance and reduce the amount of unscheduled maintenance.
- Optimise maintenance schedules to minimise the amount of maintenance required.

4.4.3 Wear mechanisms on shredder hammer tips (Geoff Kent)

Geoff Kent described the results of an investigation to identify the wear processes in white iron and tungsten carbide shredder hammer tips. He reported that the main wear processes for white iron tips were matrix removal by plastic deformation, brittle fracture of the eutectic carbides adjacent the surface and pull-out of eutectic carbides and secondary carbides adjacent the surface. For tungsten carbide tips, the main wear processes were selective removal of the cobalt binder phase, loss of entire tungsten carbide grains and cracking and chipping of individual tungsten carbide grains.

4.4.4 Sintered-tungsten carbide technology (Joydeep Duttagupta)

Joydeep Duttagupta reported on a manufacturing process used by IMCO for manufacturing shredder hammer tips. The process involves producing a sintered carbide consisting of tungsten carbide blended with fused ceramics in a chrome matrix to form an allow powder block. The arrangement was reported to increase crack resistance and extend life.

While the focus of the presentation was on shredder hammer tips, the technology has also been applied to leveller knives, trash plates, and shredder grid bars.

4.5 Novel and unconventional equipment designs

4.5.1 Keynote address: Novel and unconventional equipment designs (Dave Meadows)

Dave Meadows described the process for developing novel equipment designs. He indicated that there was a need for innovation to reduce costs, increase performance and

increase safety. Design techniques include computer aided design, computer simulation and model validation using physical measurements. Design concepts were challenged, including whether large sizes and continuous processes are always better. The design process was described, including examples using current equipment designs.

4.5.2 SRI swirl spreaders for improved boiler performance at increased loads (Geoff Kent)

Geoff Kent described SRI's swirl spreader that improves the distribution of bagasse over the furnace grate, increasing steam generating capacity by improving bagasse drying and reducing grate deposition. The design increases boiler capacity by at least 10%, improves flame stability and reduces the sensitivity to bagasse moisture content variations.

4.5.3 The Siftek membrane technology (Normand Bernier)

Vaperma have developed a revolutionary membrane system for alcohol distilleries. This system replaces the conventional rectification column and dehydration process and reduces energy consumption by up to 50%. The technology is quite new, with two demonstration plants using corn-based feedstock and one demonstration plant now constructed in Brazil using sugarcane feedstock. The system offers additional revenue from electricity due to the lower energy requirements for the plant, a continuous process and a flexible system allowing the production of both hydrous and anhydrous alcohol.

4.5.4 The use of a novel jigger system to improve vacuum pan performance (Ross Broadfoot)

Ross Broadfoot described a new jigger system for batch and continuous pans that uses incondensable gases injected in the base of a calandria to improve circulation and heat transfer. He reported improvements in average circulation rates of up to 20%, a reduction in calandria pressure of 20 kPa to 40 kPa, improvements in heat transfer coefficients from 5% to 30%, reduced average steam flow and shorter cycle times. The system is simple to install, requires little operator intervention and no special cleaning requirements.

4.5.5 Development of cane dry cleaning in Brazil (Paulo Delfini)

Paulo Delfini described the development of a dry cane cleaner in Brazil. Early experience found that it was difficult to predict the air flows within the cleaner, resulting in less than desired performance. Through the use of computational modelling, improvements were made.

To meet desired energy production requirements, Paulo Delfini indicated it is desirable to have trash contents in cane of about 13%. It is easiest to transport this trash with the cane and then separate the trash at the factory. Once separated, the trash can be washed if desired and returned to the process. Several examples of dry cleaning installations where the trash was returned to the process before the final mill and mixed directly with final bagasse were described.

5. Closing session

The author gave a brief summary of the outcomes from the workshop in the closing session. In particular:

- Several speakers articulated a shared vision of the future of the Brazilian sugar industry. This shared vision gives considerable confidence that the vision can become a reality.
- There is an increased focus on energy products. As a result, the reduction of factory energy consumption in order to maximise the energy available for products is also a focus.
- New equipment and products are being developed with reduced power consumption, lower capital and maintenance costs and better performance.
- Methods presented for reducing maintenance costs included the use of a maintenance management system, condition monitoring and material selection.

6. Site visits

The workshop included four site visits:

1. TGM. The visit included TGM's gearbox manufacturing plant and turbine manufacturing plant. The gearbox manufacturing plant produces a wide range of conventional and planetary gearboxes of 85 kN.m to 4000 kN.m capacity. The turbine manufacturing plant produces a wide range of turbines of capacity up to 250 MW.
2. Usina Mandú. This sugar factory and distillery processes about 12 000 t cane per day. There are a large number of TGM gearboxes on the milling train.
3. Usina Da Barra. This large white sugar factory and distillery processes 38 000 t cane per day. It produces a range of white crystal, amorphous and liquid sugar.
4. Dedini. The factory visited is one of Dedini's six large manufacturing facilities, specialising in the design and construction of complete sugar factories and distilleries, in addition to individual items of plant. It also services other industries such as breweries, mining and steel.

7. Conclusions

The ISSCT Engineering Workshop 2008 in Brazil was well attended with 62 participants including 39 overseas visitors from 15 countries.

The workshop addressed the theme *Design, manufacturing and maintenance of sugar mill equipment*. From the technical sessions, the following conclusions were drawn:

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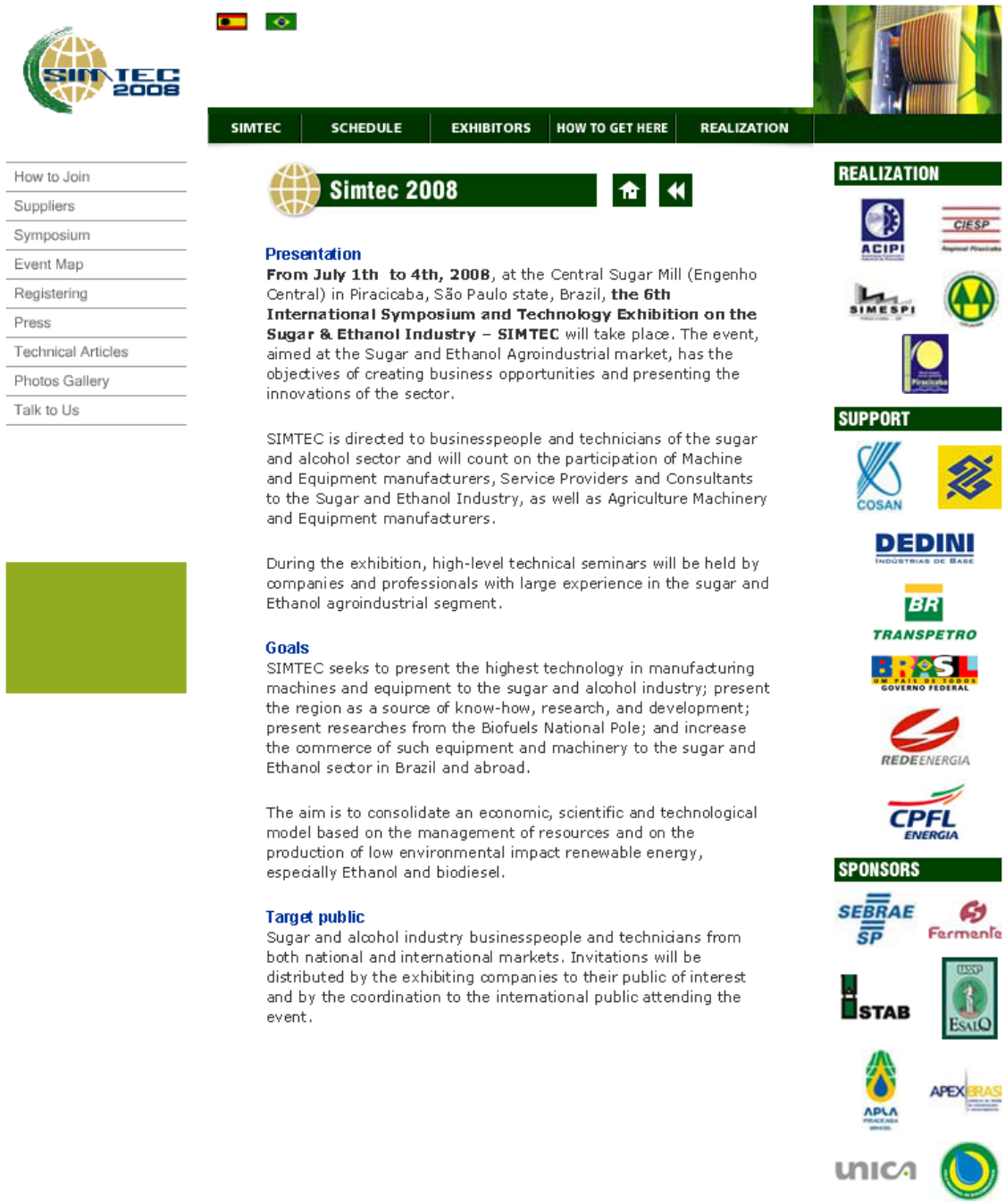
Site visits to two manufacturing facilities and two sugar mills were arranged as part of the workshop.

Appendix A SIMTEC information



SIMTEC 2008

SIMTEC | SCHEDULE | EXHIBITORS | HOW TO GET HERE | REALIZATION

- How to Join
- Suppliers
- Symposium
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- Registering
- Press
- Technical Articles
- Photos Gallery
- Talk to Us

Simtec 2008

Presentation

From July 1th to 4th, 2008, at the Central Sugar Mill (Engenho Central) in Piracicaba, São Paulo state, Brazil, **the 6th International Symposium and Technology Exhibition on the Sugar & Ethanol Industry – SIMTEC** will take place. The event, aimed at the Sugar and Ethanol Agroindustrial market, has the objectives of creating business opportunities and presenting the innovations of the sector.

SIMTEC is directed to businesspeople and technicians of the sugar and alcohol sector and will count on the participation of Machine and Equipment manufacturers, Service Providers and Consultants to the Sugar and Ethanol Industry, as well as Agriculture Machinery and Equipment manufacturers.

During the exhibition, high-level technical seminars will be held by companies and professionals with large experience in the sugar and Ethanol agroindustrial segment.

Goals

SIMTEC seeks to present the highest technology in manufacturing machines and equipment to the sugar and alcohol industry; present the region as a source of know-how, research, and development; present researches from the Biofuels National Pole; and increase the commerce of such equipment and machinery to the sugar and Ethanol sector in Brazil and abroad.

The aim is to consolidate an economic, scientific and technological model based on the management of resources and on the production of low environmental impact renewable energy, especially Ethanol and biodiesel.

Target public

Sugar and alcohol industry businesspeople and technicians from both national and international markets. Invitations will be distributed by the exhibiting companies to their public of interest and by the coordination to the international public attending the event.

REALIZATION

SUPPORT

SPONSORS

Symposium and Technology Exhibition on the Sugar & Alcohol Industry

Appendix B Workshop program

ISSCT ENGINEERING WORKSHOP
Piracicaba, BRAZIL
30 June – 4 July 2008
"Design, manufacturing and maintenance of sugar mill equipment"

PROGRAMME

Sunday 29 June 2008	
17:00 – 19:00	Registration and Welcome Function, Bristol Hotel
Monday 30 June 2008	
08:00 – 09:00	Registration, Central Sugar Mill
09:00 – 10:00	**Opening session** Chairman: *Geoff Kent, ISSCT Engineering Section Chairman, Queensland University of Technology, Australia* Welcome: *Paulo Delfini, Chairman of Workshop Organising Committee, COSAN S/A Indústria e Comércio, Brazil* Official opening: *José Francisco Calil, Secretary of Economic Development, City of Piracicaba* Overview of the sugar industry in Brazil: *Edgard Gomes Beauclair, STAB, Brazil* Welcome to SIMTEC: *Alvaro Vargas, CIESP, Brazil*
10:00 – 11:00	**Factory and factory system design and maintenance** Chairman: *Dave Meadows, Tongaat Hulett Sugar, South Africa* Keynote address: *José Luiz Olivério, Dedini S/A Indústrias de Base, Brazil*
11:00 – 11:30	Coffee break
11:30 – 12:15	**Factory and factory system design and maintenance (continued)** On line devices for process monitoring and control of the sugar production – the purity analyser: *Mathis Kuchejda and Sükrü Yilmaz, Schmidt+Haensch GmbH & Co., Germany*
12:15 – 13:00	**Factory equipment design and manufacture** Chairman: *Boris Morgenroth, IPRO Industrieprojekt GmbH, Germany* Keynote address: *Boris Morgenroth, IPRO Industrieprojekt GmbH, Germany* Concept for an energy efficient 6000 t/day cane sugar factory: *Boris Morgenroth, IPRO Industrieprojekt GmbH, Germany*
13:00 – 14:30	Lunch

14:30 – 16:00	**Factory equipment design and manufacture (continued)** Simple innovative, proven equipment and processes for improving energy efficiency in sugar factories: *Bruce Moor, Bosch Projects, South Africa* Design, manufacturing and maintenance of sugar mill equipment: *Simon Trancart, Fives Cail, France*
16:00 – 16:30	Coffee break
16:30 – 17:30	**Factory equipment design and manufacture (continued)** Main results of the application of planetary gear boxes to drive cane sugar mills: Paulo Rogério Vizin, TGM, Brazil Characteristics of the Mexican industrial sugar plant – some innovations introduced: *Manuel Enriquez Poy, Asociacion de Tecnicos Azucareros, Mexico* Computational modelling for the design of sugar mill equipment: *Geoff Kent and Ross Broadfoot, Queensland University of Technology, Australia*
Tuesday 1 July 2008	
09:00 – 10:30	**Factory equipment design and manufacture (continued)** Development of pinionless mill for energy efficiency and low maintenance: *D.K. Goel, ISGEC John Thompson, India* Design, manufacturing and maintenance of electro-hydraulic drives for the sugar industry: *Bo Ljung, Hagglunds Drives, Sweden* High pressure cogeneration in sugar plants: *A.K. Subramanian and Arun Tewari, ISGEC John Thompson, India* Efficient cooling crystallization – design and practice: *Reinhold Hempelmann, BMA, Germany* Selection, use and maintenance of process pumps in sugar industry: *Michael Yang, Sulzer Pumps, Finland*
10:30 – 11:00	**Factory equipment maintenance**, Central Sugar Mill Chairman: *D.K. Goel, ISGEC John Thompson, India* Keynote address: *Alan Yarrow, ISS-Machine Health, Australia*
11:00 – 11:30	Coffee break
11:30 – 13:00	**Factory equipment maintenance**, Central Sugar Mill Chairman: *D.K. Goel, ISGEC John Thompson, India* Formalising maintenance processes within a traditional Australian sugar milling environment to develop a culture based on improvement: *Steve Scott, New South Wales Sugar Milling Co-operative, Australia*

	Wear mechanisms on shredder hammer tips: *Geoff Kent, Queensland University of Technology, Australia*
13:00 – 14:30	Lunch
14:30 – 17:30	SIMTEC exhibition
Wednesday 2 July 2008	
09:00 – 09:30	**Factory equipment maintenance (continued)** Sintered-tungsten carbide technology: *Joydeep Dutta Gupta, IMCO Alloys, India*
09:30 – 11:00	**Novel and unconventional equipment designs**, Central Sugar Mill Chairman: *Adolfo Gomez, Cenicaña, Colombia* Keynote address: *Dave Meadows, Tongaat Hulett Sugar, South Africa* SRI swirl spreaders for improved boiler performance at increased loads: *Anthony Mann and Geoff Kent, Queensland University of Technology, Australia*
11:00 – 11:30	Coffee break
11:30 – 12:00	**Novel and unconventional equipment designs (continued)** The Siftek membrane technology: *Normand Bernier, Vaperma, Canada* The use of a novel jigger system to improve vacuum pan performance: *Ross Broadfoot, Queensland University of Technology, Australia* Development of cane dry cleaning in Brazil: *Paulo Delfini, COSAN S/A Indústria e Comércio, Brazil*
12:00 – 13:00	**Closing session** Chairman: *Geoff Kent, ISSCT Engineering Section Chairman, Queensland University of Technology, Australia* Review and discussion
13:00 – 14:30	Lunch
14:30 – 17:30	SIMTEC exhibition
19:30 – 23:00	Workshop dinner, Bristol Hotel
Thursday 3 July 2008	
07:30 – 12:00	Visit to TGM Factory
12:00 – 14:00	Lunch
14:00 – 23:00	Visit to Usina Mandú
Friday 4 July 2008	
07:30 – 12:00	Visit to Usina Da Barra

12:00 – 14:00	Lunch
14:00 – 18:00	Visit to Dedini

Appendix C List of participants

List of participants

Marcelo Genovese	Ledesma	Argentina
Ernesto Hansen	Ledesma	Argentina
Allan Seymour Yarrow	ISS-Machine Health	Australia
Stephen Scott	NSW Sugar Milling Co-op	Australia
Geoff Kent	QUT	Australia
Ross Broadfoot	QUT	Australia
Marcello Freire	Bosch	Brasil
Antonio Carlos da Rocha D'Avila	Dedini	Brasil
José Luis Olivério	Dedini	Brasil
Fernando Cesar Boscariol	Dedini	Brasil
Antonio Carlos dos Santos	EPE	Brasil
Rafael Barros Araújo	EPE	Brasil
Marcelo Paes Fernandes	Fourteam Engenheiros Ass.	Brasil
Gonzalo de La Riva	Fourteam Engenheiros Ass.	Brasil
Djalma Teixeira de Lima Filho	Grupo Naoum	Brasil
Walter Ventura F. Junior	Grupo Naoum	Brasil
Fabio Scopeta Rodrigues	IBM	Brasil
Rogério Ruiz	JLJ Ind. Comercio e Serviços Ltda	Brasil
Jose Olimpio de Resende Pereira	Jooltec Consultoria Industrial Ltda	Brasil
Carlos Roberto Xavier	Nexbio Energy	Brasil
ROLAND PINSDORF	Schuler AS	Brasil
Décio Freitas	Soluition Engenharia	Brasil
Mario Henrique Miayesi	Tema Procem	Brasil
Jefferson T. S. dos Santos	Uniweld Ind. de Eletrodos Ltda	Brasil
Antonio Helario Thomas Moreira	Woodbrook	Brasil
Hilário Moreira	Woodbrook	Brasil
Marcos Stevanato Pereira	Woodbrook	Brasil
Maximilian Goehler		Brasil
Alvaro Salla		Brasil
Normand Bernier	Vaperma	Canada
Adolfo Gomez	CENICAÑA	Colombia
Jose Essau Rodriguez		Colombia
Michael Yang	Sulzer Pumps Finland Ou	Finland
Simon Trancart	Fives Cail	France
Reinhold Hempelmann	BMA	Germany
Boris Morgenroth	IPRO	Germany
Mathis Kuchejda	Schmidt+Haensch	Germany
Jurgen Bruhns	Sugar Industry /Zuckerindustrie	Germany
Mullapudi Narendranath	Andhra Sugars	India
Maya S. Gujar	Asugar Engineering Service	India
Sampat M. Gujar	Essen Welding Alloys Pvt. Ltd.,	India
Joydeep Duttagupta	Imco	India

Dev Kumar Goel	Isgec John Thompson	India
A.K. Subramanian	Isgec John Thompson	India
Aditya S. Gujar	Mercury Systems	India
Jean Pierre Julien	Societe Usinere Du Sud	Mauritius
Robert Daniel Thevenau	Societe Usinere Du Sud	Mauritius
Juliusz Lewinski	Hagglunds Drives	Mexico
Manuel Enriquez Poy		Mexico
Ali Chua		Philippines
David Crear		Philippines
Bruce St Clair Moor	Bosch	South Africa
Ivan Voigt	Bosch	South Africa
Gavin Thain Smith	Sugar Milling Research Institute	South Africa
David Mark Meadows	Tongaat-Hulett Sugar	South Africa
Warren Kennedy Lawlor	TSB	South Africa
Clinton Vermeulen	TSB	South Africa
Jean Erasmus	TSB	South Africa
Bo Ljung	Hagglunds Vrives AB	Sweden
Charley Richard	Sugar Processing Research Institute	USA
Miguel Bellettini	Central El Palmar	Venezuela
Marcos Arraez	Central El Palmar	Venezuela