TRAINING CATALOGUE

Building the sugar industry of the future together

Cane factory, beet factory and refinery
— Extraction
— Diffusion
— Purification
— Evaporation
— Crystallization
— Centrifuging
— Drying
— Energy

PROCESS OPERATION MAINTENANCE

www.fivesgroup.com
Contents

Key factory benefits p.4
On-site training or in Fives training centres p.4
Our expertise p.5
Training tailored to your needs p.5
Training programme overview p.6
Coaching & follow-up support to enhance your training p.8
References p.8
Programme data sheets: factory level p.9
Programme data sheets: workshop level p.13
Programme data sheets: equipment level p.22
Increase value and effectiveness with training

With today’s focus on increased competitiveness and productivity, the need for well trained and skilled teams is growing. To accompany the development of your employees, we, Fives Sugar Consulting, are pleased to present our training offer to assist you in selecting the right training courses for your team.

To boost your employees’ knowledge and skills and to help them apply this effectively in the workplace, we believe a flexible training scheme is the most effective solution. As everyone has different training needs, we adopt a personal approach to building learning solutions fitted to your requirements.

We believe knowledge management is part of a long-term strategy, and we therefore propose follow-up support that can take the form of personalized coaching, conference calls or webinars, access to on-line demonstration audios or videos or ‘booster’ courses.

We want to build with you the future of our industry.
Key factory benefits

Based on experience, employees who received formal off-the-job training are up to 23%* more productive than otherwise comparable employees without training.

By giving a better understanding of the parameters affecting equipment performance and recapping good operation and maintenance practice, the training will modify on a long-term basis the working behaviour of your employees and will give them more confidence.

This will lead to:
— a significant improvement in factory operation efficiency
— a notable reduction in downtime
— maximization of sugar recovery
— a reduction in energy consumption.

Training will furthermore bring your employees a higher sense of job satisfaction, improving their motivation towards their work and positively affecting their company loyalty.

On site training or in Fives training centres

Training can take place either at your premises to suit your specific factory configurations or within our training centres.

We have facilities to carry out practical training on pilot scale evaporation and crystallization workshops in our partner training centre in Paris or at Fives Cail-KCP sugar factory in Vietnam.

Fives training centres:
— Fives Cail (Lille, Paris)
— Fives Russia (Moscow)
— Fives China (Shanghai)
— KCP, Vietnam (Tuy Hoa)
— Fives Fletcher Thailand, (Bangkok)
— Fives Mexico, (City of Mexico)
— Fives Lille Do Brazil (Ribeirão Preto)
— Fives Cail-KCP, India (Chennai)
— Fives Services South Africa (Johannesburg)
— Fives Services Australia (Brisbane)

* “The Impact of Training on Productivity and Wages: Firm Level Evidence” - Jozef Konings, Stijn Vanormelingen

One contact address:
sugar.training@fivesgroup.com
Our expertise

Our training team consists of an extended network of experienced mechanical and process engineers with more than 10 years’ experience in the sugar industry. Our trainers are a mix of commissioning/field engineers, mechanical engineers, mechanical supervisors and technical managers with highly scientific and practical backgrounds or process engineers able to provide more theoretical insights.

We pay particular attention to the pedagogical approach of our trainers and the quality of training materials so they can share their knowledge with your teams in the most effective way.

Training tailored to your needs

We provide “off the peg” training courses from the catalogue which can be adapted to your needs or made-to-measure training programmes designed to meet your specific requirements.

We define with you the theoretical to practical ratio.

You set the objectives, topics, location, performance criteria, course length and specify the items which should be the focus of the course. We send you the final programme for approval.

For any specific training, please contact us.

TESTIMONIAL

Mr Leitao has attended a group training and followed personalized coaching on mill operation and settings.

“I have been able to employ the skills and tips I learnt during this tailor-made training, with applicable results almost immediately. We were able to design a software to define mills settings. The Fives trainer was very knowledgeable and was able to tailor the training to my individual needs.”

More than 50 trainers worldwide

Over 200 people trained since 2015

More than 2,500 training hours yearly
Training programme overview

- Training are performed for operators, supervisors, mechanical & process engineers.
- Training can be done in French, English, Spanish, Thai, Russian, Chinese. Other languages upon request.
- A certificate of achievement and training manual are delivered for each training.
- Duration and content of theoretical and practical training can be adjusted to customer’s request.

### FACTORY

<table>
<thead>
<tr>
<th>Process</th>
<th>Location</th>
<th>Duration</th>
<th>Price €/p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugar manufacturing process</td>
<td>Customer’s site or Fives training centres</td>
<td>5 days</td>
<td>2 800</td>
</tr>
<tr>
<td>Energy savings</td>
<td></td>
<td>3 days</td>
<td>1 950</td>
</tr>
<tr>
<td>Sugar quality and recovery</td>
<td></td>
<td>2 days</td>
<td>1 500</td>
</tr>
</tbody>
</table>

* Provisionnal duration. ** Price given for training in Fives Centres. On quotation for training on site. Price is adjusted according to location and number of participants.
### WORKSHOP

<table>
<thead>
<tr>
<th>Process</th>
<th>Location</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation &amp; Extraction</td>
<td>Customer’s site or Fives training centres</td>
<td>4 days</td>
</tr>
<tr>
<td>Diffusion</td>
<td>On quotation</td>
<td>4 days</td>
</tr>
<tr>
<td>Purification</td>
<td></td>
<td>2 days</td>
</tr>
<tr>
<td>Evaporation</td>
<td></td>
<td>4 days</td>
</tr>
<tr>
<td>Crystallisation</td>
<td></td>
<td>4 days</td>
</tr>
<tr>
<td>Centrifuging</td>
<td></td>
<td>5 days</td>
</tr>
<tr>
<td>Drying</td>
<td></td>
<td>2 days</td>
</tr>
<tr>
<td>Steam generation</td>
<td></td>
<td>3 days</td>
</tr>
</tbody>
</table>

*Provisional duration. **Price is adjusted according to location and number of participants.

### EQUIPMENT

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Location</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mills</td>
<td>Customer’s site or Fives training centres</td>
<td>4 days</td>
</tr>
<tr>
<td>Batch pans</td>
<td></td>
<td>3 days</td>
</tr>
<tr>
<td>Continuous vacuum pans</td>
<td></td>
<td>3 days</td>
</tr>
<tr>
<td>Batch centrifugals</td>
<td></td>
<td>4 days</td>
</tr>
<tr>
<td>Continuous centrifugals</td>
<td></td>
<td>3 days</td>
</tr>
<tr>
<td>Steam turbines</td>
<td></td>
<td>2 days</td>
</tr>
</tbody>
</table>

*Provisional duration. **Price is adjusted according to location and number of participants.
Coaching & follow-up support to enhance your training

After following a training course, participants will have acquired new knowledge and skills which they then need to translate into on-site daily practice.

The kind of follow-up support depends on the needs of learners and the objectives. Effective forms of follow-up support include:

— Refresher courses
— Mentoring programmes which pair learners with more experienced counterparts
— Internet forums linking participants for mutual support
— Technical assistance to help adapt learning to a specific environment
— Personalized coaching programmes to maintain momentum and motivation

Our coaching may take the form of personalized guidance and support through workplace training sessions, regular phone or Skype conversations.

Our SMART Control monitoring system installed on your machines permits you to have a personalized and on-line follow-up, which will notably consist in the analysis of your operating data and advice to optimize the performance of your equipment.

Reference

We would like to thank our valued customers for their confidence and support.

OMNICANE — MITR PHOL SUGAR — GARDEL — TEREOS — SUCRIVOIRE — KENANA — KAYSERI — and others...
Programme data sheets

Factory level

Sugar manufacturing process p.10
Energy savings p.11
Sugar quality and recovery p.12
Sugar manufacturing process

Factory benefits

The training will help the factory staff to monitor and supervise factory performance with a deeper ability to identify ‘bottle necks’ along the process line and to make proposals to increase the sugar factory productivity and operational efficiency, leading to the improvement of factory incomes.

Learning activities

Theoretical training in classroom. The training will be conducted through an interactive multimedia presentation and will include:

- Lecturing
- Applied exercises
- Simulations of process and energy performances and factory incomes with Fives BEMEIO™, CAMEIO™ software
- Quiz
- Case studies in small groups
- Round-table

Target audience and prerequisites

This course is intended for process engineers and/or process house supervisors. It requires basic technical knowledge.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation will be carried out through multiple choice tests, discussions and question-and-answer exchange between participants and the trainer.

Deliverables

Training manual and certificate of attendance.

Operational learning objectives

At the end of the training, the participants will be able to:

- Analyse the sugar manufacturing process line
- Interpret the main product characteristics at inlet and outlet of each workshop and identify deviations
- Outline the energy consumption and production scheme of the sugar factory
- Optimize operations according to factory performance figures
- Assess how the process line choice and operation and equipment technologies affect the global incomes of the sugar factory
- Establish main factory products mass balance

Course content

- Generalities on sugar (history, world production, market, terminology...)
- Sugar production and by-products
- Beet/Cane reception
- Beet/Cane preparation (Workshop)
- Juice extraction (Workshop)
- Juice purification (Workshop)
- Juice concentration (Workshop)
- Sugar crystallization (Workshop)
- Sugar fugalling (Workshop)
- Sugar drying (Workshop)

For each of the workshop (W), the content will be:

- Position and function of workshop in process-line
- Inputs and outputs and expected ranges
- Transformation of product and physical phenomena occurring in workshop
- Main equipment and technologies
- Principle of control of workshop
- Measurement of performance of workshop

Training standard duration: 5 days
Training location: In Fives training center or on customer’s site
Training level: Factory
Available languages: French, English, Spanish, Russian, Chinese, Thai (others on request)
Contact: sugar.training@fivesgroup.com – Tel: +33 (0)3 20 88 97 47

Deliverables:

Training manual and certificate of attendance.
Energy savings

Factory benefits

The training will help the factory staff to identify, from the cane, beet or raw sugar reception to the conditioning of sugar, the measures to reduce energy consumption and/or to maximize energy production, leading to the improvement of factory incomes.

Learning activities

Theoretical training in classroom. The training will be conducted through an interactive multimedia presentation and will include:

- Lecturing with applied exercises
- Simulations of process performances and factory incomes with Fives CAMEIO™ or BEMEIO™ software
- Quiz
- Case studies in small groups and round-table

Target audience and prerequisites

This course is intended for process engineers and/or process house supervisors. It requires basic scientific knowledge.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation will be carried out through multiple choice tests, discussions and question-and-answer exchange between participants and the trainer.

Deliverables

Training manual and certificate of attendance.

Operational learning objectives

At the end of the training, the participants will be able to:
- Establish (simplified) global heat and mass balance of the sugar factory
- Calculate energy consumption and energy production of the sugar factory
- Identify sources of energy savings inside sugar factory
- Optimize operations to improve energy savings
- Assess how the process line choice and operation and equipment technologies affect the energy consumption and production
- Assess Return On Investment

Course content

- Terminology relating to energy: enthalpy, heat exchange coefficient, ...
- Basic laws of thermodynamics and heat
- Steam production cycle (Rankine, Hirn,...)
- Basic boiler theory
- Heat exchangers sizing
- Heat and mass balance
- Steam Balance
- Use of high and low pressure and process steam
- Factors affecting the energy consumption along the sugar manufacturing process line
- Optimization of vapor bleedings in multiple-effects evaporation station
Sugar quality and recovery

Factory benefits

The training will help the factory staff to identify, from the cane or beet reception to the conditioning of sugar, the measures to increase sugar recovery and sugar quality, leading to the improvement of factory incomes.

Operational learning objectives

At the end of the training, the participants will be able to:

- Define the determined and undetermined sugar losses
- Establish factory sucrose balance
- Identify sources of sugar losses inside sugar factory
- Optimize operations to improve sugar quality
- Optimize operations to improve sugar recovery
- Assess how the process line choice and operation and equipment technologies affect the sugar quality and the sugar recovery

Learning activities

Theoretical training in classroom.
The training will be conducted through an interactive multimedia presentation and will include:

- Lecturing with applied exercises
- Simulations of process performances and factory incomes with Fives CAMEIO™ or BEMEIO™ software
- Quiz
- Case studies in small groups and round-table

Target audience and prerequisites

This course is intended for process engineers and/or process house supervisors. It requires basic technical knowledge.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation will be carried out through multiple choice tests, discussions and question-and-answer exchange between participants and the trainer.

Course content

- Terminology relating to sugar quality: purity, CV, MA, form factor,…
- International sugar quality standards
- Measurements of sugar quality
- Factory sucrose balance
- Determined and undetermined sugar losses
- Factors affecting the sugar losses along the sugar manufacturing process line
- Factors affecting the color of sugar along the sugar manufacturing process line
- Damaging and attrition of sugar
Programme data sheets

Workshop level

Cane preparation and juice extraction p.14
Diffusion p.15
Purification p.16
Evaporation p.17
Crystallization p.18
Centrifuging p.19
Drying p.20
Steam generation p.21
## Cane preparation and juice extraction

### Factory benefits

The training will enable the factory to improve the efficiency of cane preparation and juice extraction workshops in order to maximize sucrose extraction, reduce downtime and energy consumption.

### Learning activities

- **Theoretical training in classroom (2 days):**
  - Lecturing and Round-table

- **Practical training in mills workshop (2 days):**
  - Visual checks of shredders, mills tandem, identification of critical parts, and review of operating parameters
  - Observation of cane feeding and regularity of operation
  - Review of control system
  - Samplings of shredded cane, juice, bagasse

### Target audience and prerequisites

This course is intended for milling operators and supervisors or milling engineers. Staff should be competent and capable of operating safely industrial equipment.

### Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

### Evaluation

Evaluation can be carried out through multiple choice-tests discussions and question-and-answer exchange between participants and the trainer.

### Deliverables

Training manual and certificate of attendance.

### Operational learning objectives

At the end of the training, the participants will be able to:

- Operate and monitor the cane preparation and juice extraction workshops, notably:
  - a. Start, shut down and clean shredders, mills and associated equipment.
  - b. Undertake visual checks of equipment and review of operating parameters
  - c. Check cane, juice and bagasse characteristics exiting the shredder and the mills meet factory requirements
  - d. Propose and take corrective actions in case of deviation to normal operation

- Carry out routine and seasonal maintenance operations (or define, supervise & optimize for engineering level)

- Evaluate performance of the cane preparation and juice extraction workshops (mostly engineering level)

- Optimize operating parameters to enhance process and energy performances of cane preparation and juice extraction workshops (mostly engineering level)

- Secure the installation, the factory staff and themselves before any operation

### Course content

- Terminology relating to cane preparation and juice extraction (preparation index imbibition, extraction, bagasse humidity,...)
- Basic principles of cane preparation and juice extraction by pressure
- Cane preparation and juice extraction workshops principle of operation and control
- Cane preparation and juice extraction workshops detailed process flow/PID (mostly engineering level)
- Shredder and mills technologies and main components
- Parameters affecting the cane preparation and juice extraction performance
- Drums, shredders and mills settings
- Mills settings calculation (mostly engineering level)
- Maintenance procedure
- Troubleshooting procedure
- Process and energy performances of shredder and mills tandem
- Other equipment in cane preparation and juice extraction workshop

---

*Fives Sugar Consulting – Training Program

**Training standard duration:** 4 days

**Training location:** In factory training center (Vietnam) or on customer’s site

**Training level:** Workshop

**Available languages:** French, English, Spanish, Russian, Chinese, Thai (others on request)

**Contact:** sugar.training@fivesgroup.com – Tel: +33 (0)3 20 88 97 47

---

*Sugar | Bioenergy*
Diffusion

Factory benefits

The training will enable the factory to improve the efficiency of diffusion workshop in order to maximize sucrose extraction, optimize water consumption, reduce downtime and energy consumption.

Learning activities

Theoretical training in classroom (1,5 days):
• Lecturing and Round-table
• Simulations of energy and process performances with Fives CAMEIO™ software (mostly engineering level)

Practical training in diffusion workshop (2,5 days):
• Visual checks of diffusion workshop with identification of critical wear parts
• Observation of the regularity of feeding/functioning diffusion workshop
• Review of equipment and workshop operating parameters and control system
• Juice samplings

Target audience

This course is intended for operators and supervisors or process engineers. Staff should be competent and capable of operating safely industrial equipment.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation will be carried out through discussions and question-and-answer exchange between participants and the trainer.

Deliverables

Training manual and certificate of attendance.

Operational learning objectives

At the end of the training, the participants will be able to:

- Operate and monitor the diffusion workshop, notably:
  a. Start, shut down and clean the diffusion workshop
  b. Undertake visual checks of diffusion workshop and review of operating parameters
  c. Check juice and bagasse characteristics exiting the diffuser meet factory requirements
  d. Propose and take corrective actions in case of deviation to normal operation
- Carry out routine and seasonal maintenance operations (or define, supervise & optimize for engineering level)
- Evaluate performance of the diffusion workshop (mostly engineering level)
- Optimize operating parameters to enhance process and energy performances (mostly engineering level)
- Secure the installation, the factory staff and themselves before any operation

Course content

- Terminology relating to juice diffusion
- Basic principles of juice extraction by diffusion
- Diffusion workshop principle of operation and control
- Diffusion workshop detailed process flow/PID (mostly engineering level)
- Diffusers technologies and main components
- Comparison with milling (cane)
- Process and energy performances of diffusers
- Parameters affecting the diffuser performance (quality of cane/beet, cane/beet feed rate, bed speed, recycling of water, diffuser temperature,…)
- Diffusion workshop settings
- Diffusion workshop maintenance procedure
- Troubleshooting procedure
- Microbiology of extraction
- Process and energy performances of diffuser (mostly engineering level)
- Other equipment in diffusion workshop
Purification

Factory benefits

The training will enable the factory to improve the overall efficiency of purification station. It will permit the factory to optimize its operation in order to, maximize sugar recovery, reduce color formation and sugar losses and to reduce downtime.

Operational learning objectives

At the end of the training, the participants will be able to:

- Operate in manual and automatic mode and monitor the purification station, notably:
  - Start, shut down and clean purification station
  - Undertake visual checks of equipment and review of operating parameters
  - Check clarified juice and mud characteristics exiting the purification station meet factory requirements
  - Propose and take corrective actions in case of deviation to normal operation
- Carry out routine and seasonal maintenance operations (or define, supervise & optimize for engineering level).
- Evaluate process performances of the purification station (mostly engineering level)
- Optimize operating parameters to enhance process performances of purification station (mostly engineering level)
- Secure the installation, the factory staff and themselves before any operation

Course content

- Terminology relating to clarified juice (juice turbidity, mud, milk of lime, flocculant, ...)
- Basic principles of purification (defecation, sulfitation, phosphatation, carbonatation, ...)
- Purification station principle of operation and control
- Clarifier technologies and main components (feed launder, deflector plate, scrapers, ...)
- Purification station detailed process flow/PID (mostly engineering level)
- Parameters affecting clarified juice characteristics (lime addition pH, temperature, ...)
- Routine and seasonal maintenance procedures
- Troubleshooting procedure
- Process performances of purification workshop (mostly engineering level)
- Other equipment in purification workshop (flash tank, mud, mixer, rotary vacuum filter)

Learning activities

Theoretical training in classroom (1 day):
- Lecturing and Round-table

Practical training in purification workshop (1 day):
- Visual checks of purification station and review of operating parameters
- Assessment of current clarification procedure
- Juice samplings and turbidity assessment

Target audience

This course is intended for process house supervisors, process engineers and operators.
Staff should be competent and capable of operating safely industrial equipment.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation can be carried out through multiple choice-tests discussions and question-and-answer exchange between participants and the trainer.

Deliverables

Training manual and certificate of attendance.
Evaporation

Factory benefits

The training will permit the factory to optimize the operation of the evaporators in order to reduce energy consumption, reduce downtime, minimize sucrose losses and color formation. It will give the factory staff a deeper knowledge of operating and setting parameters of the evaporation station.

Learning activities

Theoretical training in classroom (2 days):
- Lecturing with applied exercises
- Round-table
- Simulations of energy and process performances with Fives BEMEIO™/CAMEIO™ software (mostly engineering level)

Practical training in evaporators station (2 days):
- Visual checks evaporation station and review of operating parameters
- Review of control system
- Assessment of current cleaning procedures
- Samplings of juice and Brix profile

Target audience

This course is intended for process house supervisors, process engineers and evaporation operators. Staff should be competent and capable of operating safely industrial equipment.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation can be carried out through multiple choice-tests, discussions and question-and-answer exchange between participants and the trainer.

Deliverables

Training manual and certificate of attendance.

Operational learning objectives

At the end of the training, the participants should be able to:
- Operate and monitor the evaporators station, notably:
  a. Start, shut down and clean evaporation station
  b. Undertake visual checks of equipment and review of operating parameters
  c. Check syrup characteristics exiting the evaporation station meet factory requirements
  d. Propose and take corrective actions in case of deviation to normal operation
- Carry out routine and seasonal maintenance operations (or define, supervise & optimize for engineering level) including chemical cleaning and mechanical cleaning.
- Evaluate process and energy performances of the evaporation station and identify impact of scaling effects (mostly engineering level)
- Optimize operating parameters to enhance process and energy performances of evaporation station (mostly engineering level)
- Secure the installation, the factory staff and themselves before any operation

Course content

- Terminology relating to juice evaporation (Saturated steam, BPE, ...)
- Basic principles of juice evaporation (Steam physical laws, Heat transfer in evaporators, Rillieux’s principles)
- Condensates and steam recovery system
- Creation of vacuum and various means to create it
- Evaporator technologies and main components
- Evaporation station principle of operation and control
- Single evaporators and evaporation station detailed PID (mostly engineering level)
- Parameters affecting the syrup characteristics
- Scaling of evaporators
- Chemical and mechanical cleaning procedures of evaporators
- Routine and seasonal maintenance procedures
- Troubleshooting procedure
- Process and energy performances of evaporation station (mostly engineering level)
- Other equipment in evaporation station

www.fivesgroup.com

Training standard duration: 4 days
Training location: In factory training center (Vietnam) or on customer’s site
Training level: Workshop
Available languages: French, English, Spanish, Russian, Chinese, Thai (others on request)
Contact: sugar.training@fivesgroup.com - Tel: +33 (0)3 20 88 97 47
Crystallization

Factory benefits

The training will permit the factory to optimize the operation in order to maximize sugar recovery, reduce color formation, downtime and energy consumption. It will give the factory staff a deeper understanding of operating and setting parameters of the crystallization workshop.

Operational learning objectives

At the end of the training, the participants will be able to:

- Operate in manual and automatic mode and monitor the crystallization workshop, notably:
  a. Start, shut down and clean crystallization workshop
  b. Undertake visual checks of equipment and review of operating parameters
  c. Check Massecuite(s), molasses and sugar crystals characteristics exiting the crystallization workshop meet factory requirements
  d. Propose and take corrective actions in case of deviation to normal operation
- Carry out routine and seasonal maintenance operations including pans cleaning (or define, supervise and optimize for engineering level).
- Evaluate process and energy performances of the crystallization workshop and identify scaling effects (mostly engineering level)
- Optimize operating parameters to enhance process and energy performances of crystallization workshop (mostly engineering level)
- Secure the installation, the factory staff and themselves before any operation

Course content

- Terminology relating to Sugar quality (CV, MA, ...), Massecuite, Molasses
- Basic principles of crystallization and main crystallization schemes (C-B-A, C-B/C-A, ...)
- Principle of operation and control of the crystallization workshop
- Crystallizers technologies and main components (calandria, feed system, separator, ...)
- Detailed process flow/PID of the crystallization workshop (mostly engineering level)
- Parameters affecting Massecuite characteristics (seed quality, vacuum, circulation, ...)
- Routine and seasonal maintenance procedures
- Troubleshooting procedure
- Process and energy performances of crystallization workshop (mostly engineering level)
- Other equipment in crystallization workshop

Learning activities

Theoretical training in classroom (2 days):
- Lecturing with applied exercises
- Round-table
- Simulations of energy and process performances with BEMEIO™/CAMEIO™ software (mostly engineering level)

Practical training in crystallization workshop (2 days):
- Visual checks of vacuum pans and crystallization workshop and review of operating parameters
- Assessment of current cleaning procedures
- Samplings of Massecuite and drawing of brix profile

Target audience

This course is intended for process house supervisors, process engineers and boilers. Staff should be competent and capable of operating safely industrial equipment.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation can be carried out through multiple choice-tests discussions and question-and-answer exchange between participants and the trainer.

Deliverables

Training manual and certificate of attendance.
Centrifuging

Factory benefits

The training will permit the factory to optimize the operation of the station in order to maximize throughput and sugar quality, to decrease final molasses purity and to reduce downtime and energy consumption. It will give the factory staff a deeper understanding of operating and setting parameters of the centrifuging station.

Learning activities

Theoretical training in classroom (2 days):
- Lecturing and Round-table
- Case studies (mostly engineering level)

Practical training in centrifuging station (3 days):
- Visual checks of centrifuging station, identification of critical wear parts, and review of operating parameters
- Settings of batch and continuous centrifugals
- MasseCuite, run-off, sugar samplings

Target audience

This course is intended for process house supervisors, process engineers and operators. Staff should be competent and capable of operating safely industrial equipment.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation can be carried out through multiple choice-tests discussions and question-and-answer exchange between participants and the trainer.

Deliverables

Training manual and certificate of attendance.

Operational learning objectives

At the end of the training, the participants will be able to:
- Operate and monitor the centrifuging station, notably:
  a. Start, shut down and clean centrifuging station
  b. Undertake visual checks of equipment and review of operating parameters
  c. Check sugar and molasses characteristics exiting the centrifuging station meet factory requirements
  d. Propose and take corrective actions in case of deviation to normal operation
- Carry out routine and seasonal maintenance operations (or define, supervise & optimize for engineering level)
- Evaluate process performances of the centrifuging station (mostly engineering level)
- Optimize operating parameters to enhance process performances of centrifuging station (mostly engineering level)
- Secure the installation, the factory staff and themselves before any operation

Course content

- Terminology relating to Sugar, MasseCuite, Molasses/Run-Off quality
- Basic principles of centrifuging
- Centrifugal principle of operation and control (Batch and continuous)
- Centrifugal station detailed process flow/PID (mostly engineering level)
- Centrifugals technologies and main components (Batch and continuous)
- Parameters affecting centrifugals performance (Massecuite characteristics, speed, washing rate, ...)
- Innovating solutions to increase productivity and sugar quality (Smart Control, colorimeter, ...)
- Hazard awareness
- Maintenance procedure
- Troubleshooting procedure
- Process and energy performances of centrifuging station (mostly engineering level)
- Installation best practice
**Factory benefits**

The training will permit the factory to optimize the operation of the drying workshop in order to maximize sugar quality, to decrease sugar losses and dust emissions and to reduce downtime. It will give the factory staff a deeper understanding of operating and setting parameters of the drying workshop.

---

**Operational learning objectives**

At the end of the training, the participants will be able to:

- Operate and monitor the drying workshop, notably:
  - a. Start, shut down and clean drying workshop
  - b. Undertake visual checks of equipment and review of operating parameters
  - c. Check sugar crystals characteristics exiting the drying workshop meet factory requirements
  - d. Propose and take corrective actions in case of deviation to normal operation
- Carry out routine and seasonal maintenance operations (or define, supervise & optimize for engineering level)
- Evaluate process performances of the drying workshop (mostly engineering level)
- Optimize operating parameters to enhance process performances of drying workshop (mostly engineering level)
- Secure the installation, the factory staff and themselves before any operation

---

**Course content**

- Terminology relating to sugar crystals quality (humidity, MA and CV), air treatment
- Basic principles of sugar drying and sugar conditioning (Sorption-Desorption, Mollier diagram)
- Fundamentals on air treatment techniques (filtration, heating, cooling, gas scrubbing, fan)
- Drying workshop principle of operation and control
- Drying workshop detailed process flow/PID (mostly engineering level)
- Drying technology and main components
- Parameters affecting the drying performance (sugar inlet characteristics, air flow,...)
- Maintenance procedure
- Troubleshooting procedure
- Process performances of drying workshop (mostly engineering level)
- Other equipment in drying workshop
Steam generation

Factory benefits

The training will enable the factory to improve the efficiency of boiler in order to reduce downtime, reduce water wastage while ensuring a safe operation of power house.

Operational learning objectives

At the end of the training, the participants will be able to:

- Operate and monitor the steam generation station, notably:
  - a. Start, shut down and boiler
  - b. Undertake visual checks of equipment (steam and condensates system) and review of operating parameters
  - c. Check steam and fumes characteristics exiting the boiler meet factory requirements
  - d. Check water quality
  - e. Check the proper functioning of safety devices
  - f. Propose and take corrective actions in case of deviation to normal operation

- Define, supervise & optimize routine and seasonal maintenance operations
- Evaluate process and energy performances of the boiler
- Optimize operating parameters to enhance energy performances of boiler station
- Secure the installation, the factory staff and themselves before any operation

Learning activities

Theoretical training in classroom (2 days):
- Lecturing
- Round-table
- Simulations of energy and process performances with Fives CAMEIO™ software

Practical training in power house (1 day):
- Visual checks of boiler and review of operating parameters
- Review of control system
- Review of water purging

Target audience

This course is intended for boiler/power house supervisors and process engineers. Staff should be competent and capable of operating industrial equipment.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation will be carried out through discussions and question-and-answer exchange between participants and the trainer.

Deliverables

Training manual and certificate of attendance.

Course content

- Terminology relating to boiler operation and electricity production
- Basic principles of combustion and boiler operation (principles of heat transfer properties of steam, steam cycle)
- Boiler system layout
- Boiler principle of operation and control
- Power house detailed process flow/PID (mostly engineering level)
- Boilers technologies and main components
- Parameters affecting the boiler efficiency (Effect of bagasse quality on boiler operation, bagasse feeding, burner,...)
- Water quality: scale deposition, slush, corrosion, drain, primage, boiler blowdown
- Typical cause for water contamination and corrective actions required
- Start-up/Shut down/emergency situations procedures
- Maintenance procedure
- Troubleshooting procedure
- Other equipment in power house (feed pumps, heat exchangers, filters,...)
Programme data sheets

Equipment level

Mills p.24
Batch pans p.25
Continuous vacuum pans p.26
Batch centrifugals p.27
Continuous centrifugals p.28
Steam Turbines p.29
Mills

Factory benefits

The training will help the factory staff in the operation, monitoring and maintenance of mills permitting to maximize crushing capacity and sucrose extraction, to decrease bagasse humidity and POL, to reduce downtime and to help reducing energy consumption.

Learning activities

Theoretical training in classroom (1.5 day):
- Lecturing and Round-table

Practical training in mills workshop (2.5 days):
- Visual checks of mills, identification of wear parts
- Review of the regularity of the mills operation
- Review of operating and adjustment parameters notably imbibition, cylinders rotating speeds, cylinders openings, Donnelly chutes openings...
- Review of mills sanitation procedure
- Bagasse and juice samplings and interpretation of performances

Target audience

This course is intended for mills operators and supervisors or milling engineers. Staff should be competent and capable of operating safely industrial equipment.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation will be carried out through discussions and question-and-answer exchange between participants and the trainer.

Deliverables

Training manual and certificate of attendance.

Operational learning objectives

At the end of the training, the participants will be able to:
- Operate and monitor the mills in manual and automatic mode, notably:
  a. Start, shut down and clean the mills
  b. Undertake checks of mills operating and performance parameters
  c. Identify and take corrective actions to deviations to normal operation
- Carry out routine and seasonal maintenance operations (Define, supervise & optimize for engineering level)
- Evaluate performance of the mills
- Optimize operating parameters to enhance process and energy performance of mills
- Secure the installation and themselves before any operation

Course content

- Terminology relating to mills
- History and types of mills
- Basic principles of milling (basic mills settings calculation at engineering level)
- Mills mechanical description
- Basic principles of mills operation and control
- Mills cleaning procedures
- Maintenance procedure and best practices
- Troubleshooting procedure

Training standard duration: 4 days
Training location: In factory training center (Vietnam) or on customer’s site
Training level: Equipment
Available languages: French, English, Spanish, Russian, Chinese, Thai (others on request)
Contact: sugar.training@fivesgroup.com – Tel: +33 (0)3 20 88 97 47
Batch pans

Factory benefits

The training will help the factory staff in the operation, monitoring and maintenance of batch pans permitting to maximize throughput and sugar quality, to reduce downtime, and to help reducing energy consumption.

Learning activities

Theoretical training in classroom (1 day):
- Lecturing and Round-table

Practical training on batch pans (2 days):
- Visual checks of batch pan components and installation
- Review of current batch pan cycle
- Review of operating parameters of batch pan such as stirrer load, vacuum, ...
- Review of cleaning procedures (pans, probes)
- Study of seed magma, slurry preparation procedures
- Samplings and analysis of products

Target audience

This course is intended for pans boilers and process house supervisors or process engineers. Staff should be competent and capable of operating safely industrial equipment.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation will be carried out through discussions and question-and-answer exchange between participants and the trainer.

Deliverables

Training manual and certificate of attendance.

Operational learning objectives

At the end of the training, the participants will be able to:
- Operate and monitor the batch pans in manual and automatic mode, notably:
  a. Start, shut down and clean the batch pans
  b. Undertake checks of batch pans operating and performance parameters (Massecuite(s), molasses and sugar crystals qualities)
  c. Identify and take corrective actions to deviations to normal operation
- Carry out routine and seasonal maintenance operations (Define, supervise & optimize for engineering level)
- Evaluate performance of the batch pans
- Optimize operating parameters to enhance process and energy performance of batch pans
- Secure the installation and themselves before any operation

Course content

- Terminology relating to batch pans
- Basic principles of crystallization
- Batch pans mechanical description
- History and types of batch pans and comparison with vacuum pans
- Basic principles of batch pans operation and control
- Batch pan cycle
- Parameters affecting batch pans performance (circulation, hydrostatic head, purities of pan feed, ...)
- Preparation of A, B, & C magma and grain for high/low grade seed/Massecuite production
- Creation and control of vacuum
- Maintenance procedure and best practices
- Troubleshooting procedure

Training standard duration: 3 days
Training location: In factory training center (Vietnam) or on customer’s site
Training level: Equipment
Available languages: French, English, Spanish, Russian, Chinese, Thai
(others on request)
Contact: sugar.training@fivesgroup.com – Tel: +33 (0)3 20 88 97 47
Continuous vacuum pans

Factory benefits

The training will help the factory staff in the operation, monitoring and maintenance of continuous vacuum pans permitting to maximize throughput and sugar quality, to reduce downtime, and to help reducing energy consumption.

Learning activities

Theoretical training in classroom (1 day):
- Lecturing and Round-table

Practical training on continuous vacuum pans (2 days):
- Visual checks of continuous vacuum pan components and installation
- Review of operating parameters of continuous vacuum pan such as vacuum, sugar crystal size and distribution, steam pressure, pan circulation, magma and liquor feeding, sugar entrainment in vapor
- Assessment of current cleaning procedures
- Samplings and analysis of products

Target audience

This course is intended for pans boilers and process house supervisors or process engineers. Staff should be competent and capable of operating safely industrial equipment.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation will be carried out through discussions and question-and-answer exchange between participants and the trainer.

Deliverables

Training manual and certificate of attendance.

Operational learning objectives

At the end of the training, the participants will be able to:
- Operate and monitor the continuous vacuum pans in manual and automatic mode, notably:
  a. Start, shut down and clean the continuous vacuum pans
  b. Undertake checks of continuous vacuum pans operating and performance parameters (Massecuite(s), molasses and sugar crystals qualities)
  c. Identify and take corrective actions to deviations to normal operation
- Carry out routine and seasonal maintenance operations (Define, supervise & optimize for engineering level)
- Evaluate performance of the continuous vacuum pan
- Optimize operating parameters to enhance process and energy performance of continuous vacuum pans
- Secure the installation and themselves before any operation

Course content

- Terminology relating to continuous pans (solubility, supersaturation, crystal growth,...)
- Basic principles of crystallization
- Types of continuous vacuum pans
- Continuous vacuum pans mechanical description
- Basic principles of continuous vacuum pans operation and control
- Creation and control of vacuum
- Continuous vacuum pan heat and mass balance (mostly engineering level)
- Cleaning procedures (steam-on-the-run, pans, probes)
- Maintenance best practice
- Troubleshooting procedure

Training standard duration: 3 days
Training location: In factory training center (Vietnam) or on customer’s site
Training level: Equipment
Available languages: French, English, Spanish, Russian, Chinese, Thai (others on request)
Contact: sugar.training@fivesgroup.com - Tel: +33 (0)3 20 88 97 47

www.fivesgroup.com
Batch centrifugals

Factory benefits

The training will help the factory staff in the operation, monitoring and maintenance of batch centrifugals permitting to maximize throughput and sugar quality, to decrease run-off purity difference and to reduce downtime and energy consumption.

Operational learning objectives

At the end of the training, the participants will be able to:

— Operate and monitor the batch centrifugals notably:
  a. Start, shut down and clean the batch centrifugals
  b. Undertake checks of batch centrifugals operating and performance parameters (Massecuite(s), molasses/run-off and sugar crystals)
  c. Identify and take corrective actions to deviations to normal operation

— Carry out routine and seasonal maintenance operations (Define, supervise & optimize for engineering level)
— Evaluate performance of the batch centrifugals
— Optimize operating parameters to enhance process performance of batch centrifugals
— Secure the installation, the factory staff and themselves before any operation

Learning activities

Theoretical training in classroom (1 day):
• Lecturing and Round-table
Practical training on a batch centrifugal (3 days):
• Visual checks of centrifugal components and review of operating parameters
• Adjustment of cycle time and settings
• Samplings of products (sugar, run-off)
• Review of maintenance operations among (mostly operator level):
  - Disassembly an reassembly of centrifugal: suspension, supporting frame,...
  - Checking and settings of wear clearances
  - Replacement of wear parts (seals,...)

Target audience

This course is intended for operators or process house supervisors and process engineers. Staff should be capable of operating safely industrial equipment.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation will be carried out through discussions and question-and-answer exchange between participants and the trainer.

Course content

— Terminology relating to batch centrifugal
— Basic principles of centrifuging
— Batch centrifugal technologies
— Basic principles of batch centrifugal operation
— Batch centrifugal technologies
— Batch centrifugal mechanical description
— Batch centrifugal cycle
— Parameters affecting the performance of batch centrifugals (Massecuite Inlet characteristics, washing, spin time, cycle,...)
— Innovating solutions to increase productivity and sugar quality (Smart Control, colorimeter,...)
— Hazard awareness
— Maintenance procedures
— Troubleshooting procedure

Deliverables

Training manual and certificate of attendance.
Continuous centrifugals

Factory benefits

The training will help the factory staff in the operation, monitoring and maintenance in the operation, monitoring and maintenance of continuous centrifugals permitting to maximize throughput and sugar quality, to decrease final molasses purity and to reduce downtime.

Learning activities

Theoretical training in classroom (1 day):
- Lecturing and Round-table

Practical training on a continuous centrifugal (2 days):
- Visual checks of continuous centrifugal components and review of operating parameters
- Settings of continuous centrifugals
- Samplings of products (sugar, run-off)
- Review of maintenance operations among:
  - Checking/Disassembly/Reassembly of baskets and screens, pulleys, bearing,…
  - Checkings and settings of wear clearances
  - Replacement of wear parts (bearings,…)

Target audience

This course is intended for operators or process house supervisors and process engineers. Staff should be capable of operating safely industrial equipment.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation can be carried out through multiple-choice-tests, discussions and question-and-answer exchange between participants and the trainer.

Course content

- Terminology relating to continuous centrifugals
- Basic principles of centrifuging
- Basic principles of continuous centrifugal operation
- Continuous centrifugal technologies
- Parameters affecting the performance of continuous centrifugals (Massecuite Inlet characteristics, washing, rotating speed,…)
- Continuous centrifugal mechanical description
- Maintenance procedure
- Troubleshooting procedure

Operational learning objectives

At the end of the training, the participants will be able to:
- Operate and monitor the continuous centrifugals:
  a. Start, shut down and clean the continuous centrifugals
  b. Undertake checks of continuous centrifugals operating and performance parameters (Massecuite(s), molasses/run-off and sugar crystals)
  c. Identify and take corrective actions to deviations to normal operation
- Carry out routine and seasonal maintenance operations (Define, supervise & optimize for engineering level)
- Evaluate performance of the continuous centrifugals
- Optimize operating parameters to enhance process performance of continuous centrifugals
- Secure the installation, the factory staff and themselves before any operation

Deliverables

Training manual and certificate of attendance.
Steam Turbines

Factory benefits

The training will enable the factory to reduce downtime and to enhance steam turbine reliability and durability. The factory staff will gain an understanding of all the different components of a turbine necessary for the operation, maintenance and troubleshooting of steam turbines.

Learning activities

Theoretical training in classroom (0.5 day):
- Lecturing and Round-table

Practical training on steam turbine (1.5 day):
- Visual checks of steam turbine
- Review of operating parameters
- Review of control system
- Review of maintenance procedures, of which:
  - Setting of clearance of axial displacement
  - Measure and setting of steam injection clearances
  - Measure and settings of limit clearances in bearings

Target audience

This course is intended for steam turbine operators or boiler house supervisors. Staff should be competent and capable of operating safely industrial equipment.

Training follow-up

Optional “booster” courses, personalized coaching or tutoring can be organized upon request.

Evaluation

Evaluation will be carried out through discussions and question-and-answer exchange between participants and the trainer.

Deliverables

Training manual and certificate of attendance.

Operational learning objectives

At the end of the training, the participants will be able to:
- Operate and monitor the steam turbine on a stable or unstable network, notably:
  - Start, shut down and clean the steam turbine
  - Undertake checks of steam turbine operating and performance parameters
  - Identify and take corrective actions to deviations to normal operation
- Carry out (or define, supervise & optimize for engineering level) routine and seasonal maintenance operations
- Evaluate performance of steam turbine
- Optimize operating parameters to enhance of steam turbine
- Secure the installation, the factory staff and themselves before any operation

Course content

- Terminology relating to steam turbine
- Main steam turbine technologies (counter-pressure, condensation)
- Main steam turbine designs (action, reaction)
- Steam basic laws (mostly engineering level)
- Steam turbine basic principle of operation and control
- Steam turbine mechanical description
- Electricity production principle with an alternator
- Functioning modes of a steam turbine (mostly engineering level)
- Vibrations of a rotating equipment
- Maintenance procedure
- Troubleshooting procedure
Fives Cail is a certified training organization.
N° activity: 32 59 09 223 59