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New approach to sugar drying and cooling

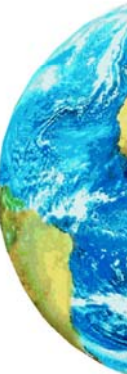
36th Meeting of ASSBT

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Albuquerque, New Mexico

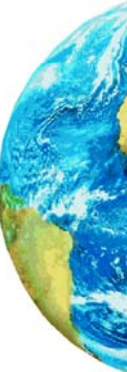
Hartmut Hafemann, Reinhold Hempelmann*

BMA AG



New approach to sugar drying and cooling

- q *Importance of sugar drying & cooling*
- q *Well-established solutions*
- q *Challenges*
- q *The new VFC – Vertical Fluidized bed Conditioner*



Importance of sugar drying & cooling

Required results

- q *Max. residual moisture content: 0.03 % - 0.04%*
- q *Max. storage temperature: 25 to 40 °C / 77 to 104°F*
- q *No sugar lumps*



Importance of sugar drying & cooling

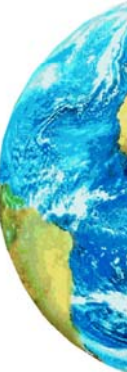
Process kinetics

- q ***2 simultaneous processes:***
 - Evaporating water
 - Crystallizing sugar

- q ***Conditioning phase during the first few days after production***

- q ***Loss of water-binding properties***

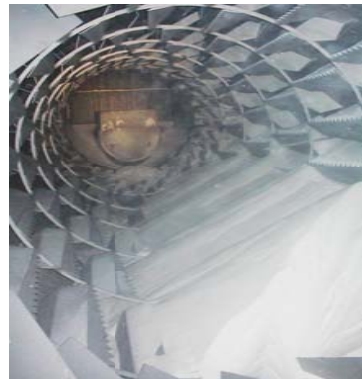
- q ***Solution: slow drying combined with gentle movement***



Well-established Solutions

- q ***Drum dryer & cooler***
 - Reliable and sturdy
 - Limited cooling effect

- q ***Drum dryer & cooler with air conditioning system***
 - Increased cooling effect
 - Constant inlet air temperature
 - Relatively high energy requirements



Well-established Solutions

☞ ***Drum dryer & cooler with additional fluidized bed conditioner***

Excellent heat transfer characteristics

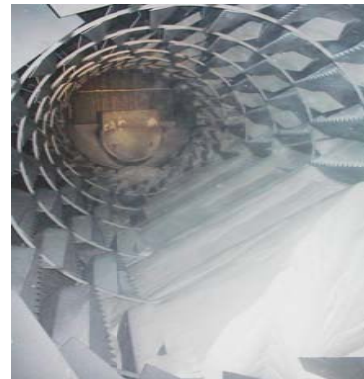
Constant sugar outlet temperature

Additional drying properties

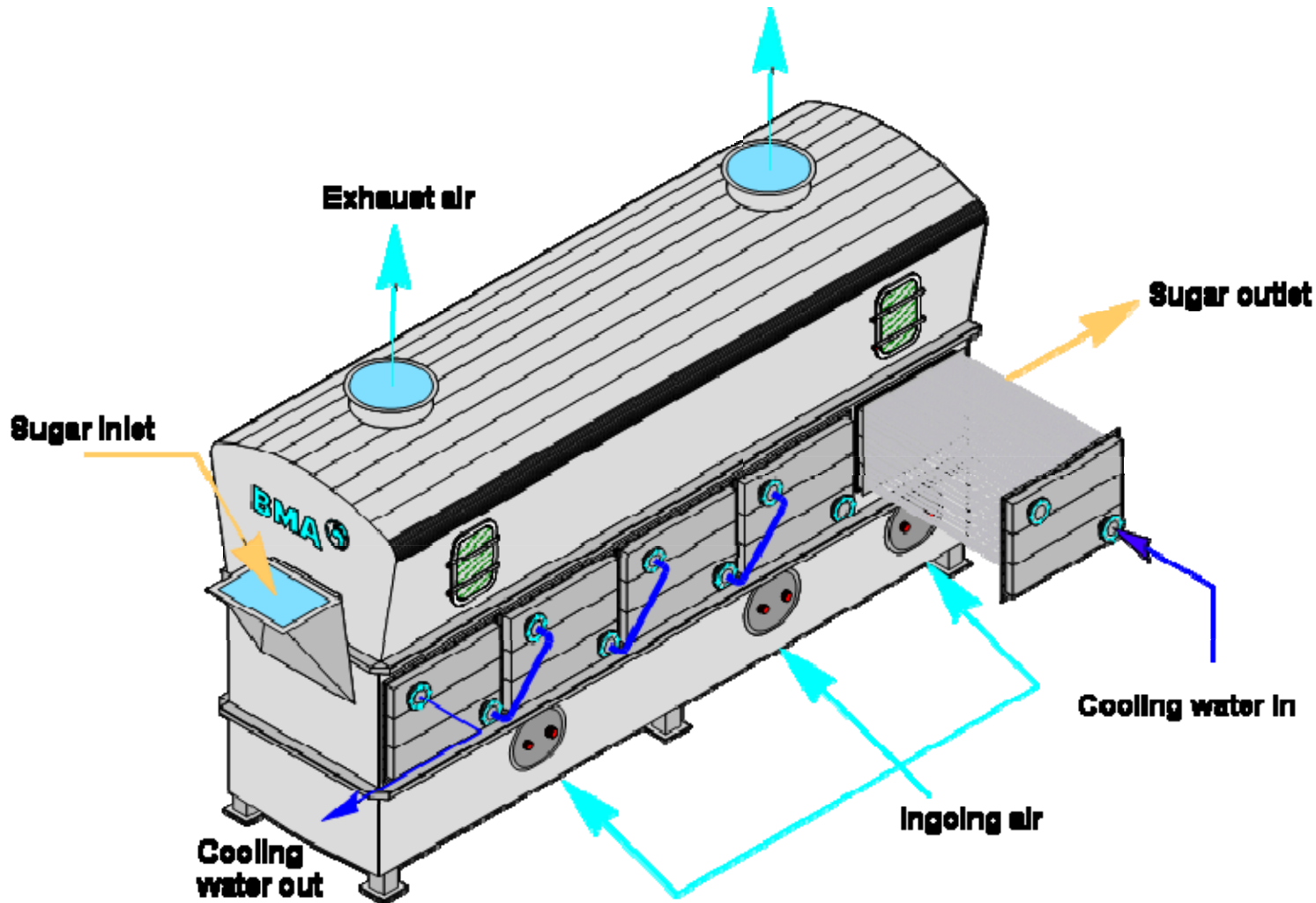
Gentle sugar treatment

☞ ***Drum dryer & cooler with additional fluidized bed conditioner and operated with conditioned cooling air***

Applicable even under extreme incoming air conditions



Fluidized bed unit with integrated cooling surfaces

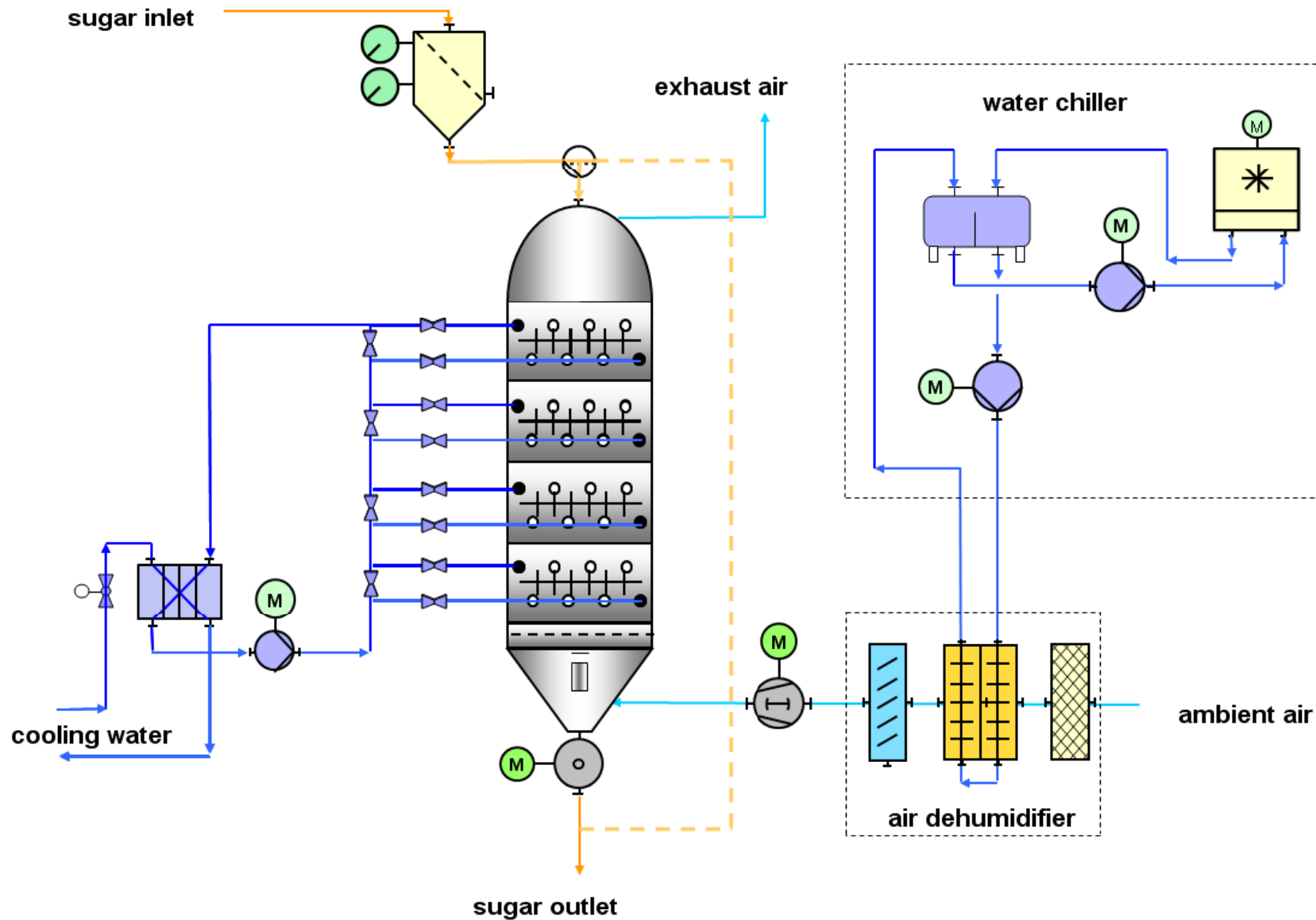


Challenges

- q **Expansion**
 - Higher capacities
 - Limited space available
- q **Energy savings**
 - Costs
 - Legal requirements
- q **Sugar quality**
 - Storage
 - Transportation
- q **Climatic conditions**
 - Cooling & dehumidifying of inlet air



VFC – Vertical Fluidized Bed Conditioner (I)



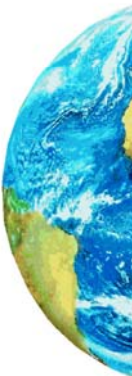
VFC – Vertical Fluidized Bed Conditioner (II)

- q **Excellent heat transfer**
Fluidized bed technology
- q **Little air consumption**
Vertical arrangement of heat exchangers
Product flow by gravity
- q **Energy savings**
Efficient air cooling & dehumidifying
Intelligent re-feed of air into drum dryer
- q **Small footprint**
2.000 x 1.800mm / 78.74 x 70.86"



VFC – Vertical Fluidized Bed Conditioner (III)

- q ***Constant sugar outlet temperature***
- q ***High throughput***
Up to 100mt/h
- q ***Mass transfer***
Additional drying capability
- q ***Suited for installation in tropical climate***
- q ***Low maintenance***



Dimensions of the VFC-series

VFC Series

q *Width* **2.000 mm / 78.7"**

q *Length* **1.800 mm / 70.9"**

Total height

q *VFC 16/2* **5.360 mm / 211.1"**

q *VFC 16/3* **6.320 mm / 248.8"**

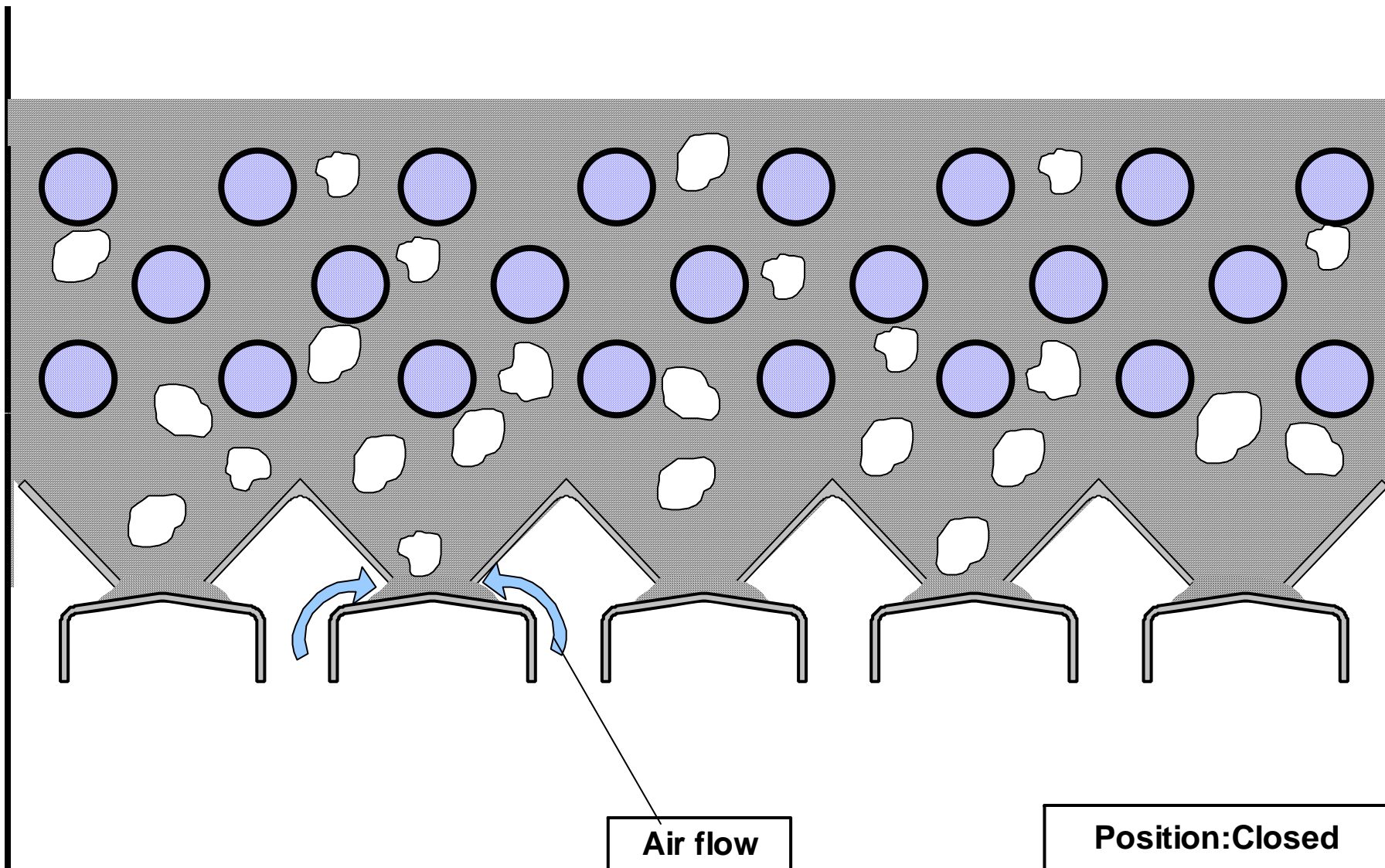
q *VFC 16/4* **7.280 mm / 286.6"**

q *VFC 16/5* **8.240 mm / 324.4"**



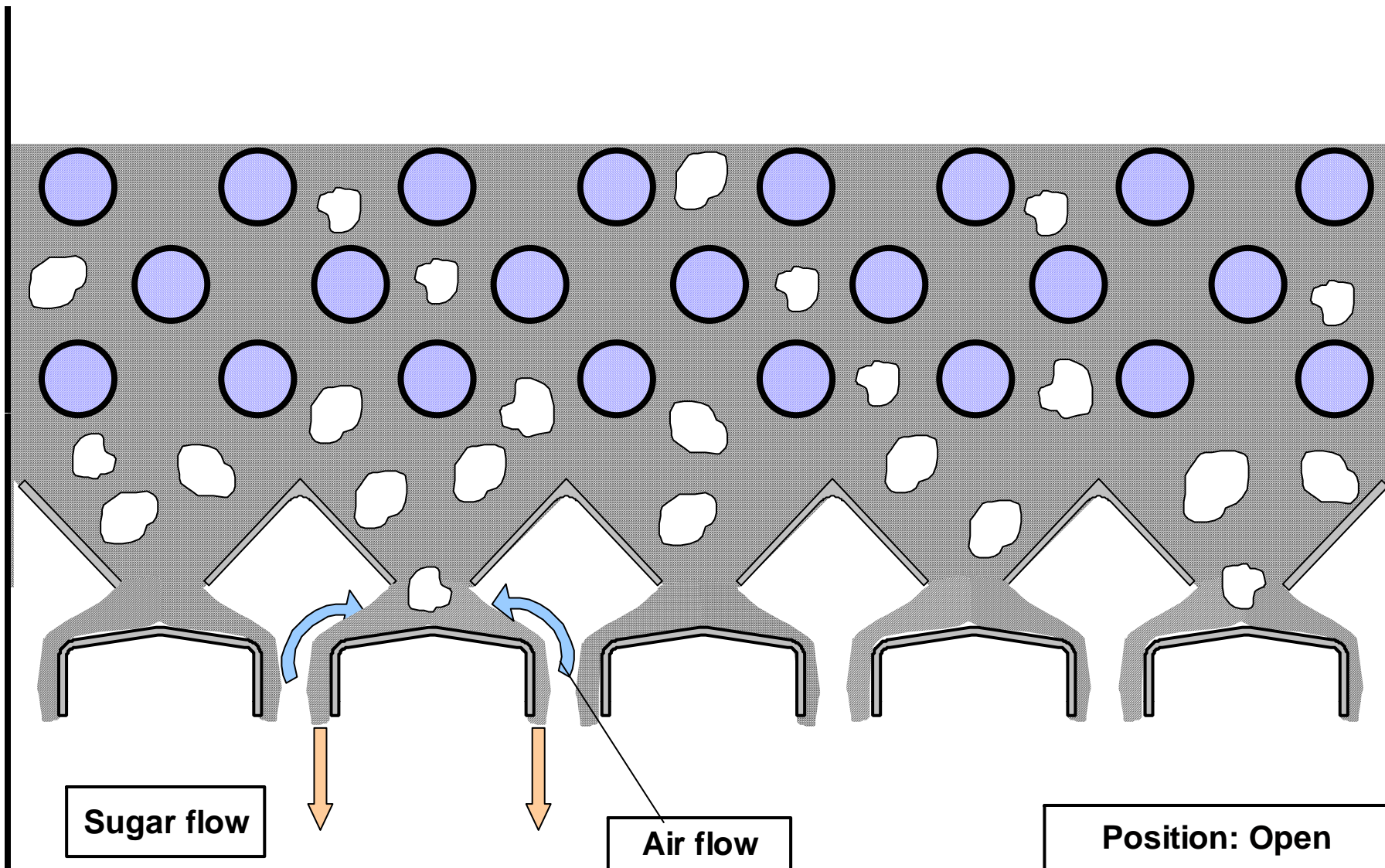
VFC – Vertical Fluidized Bed Conditioner

Principle of sugar flow



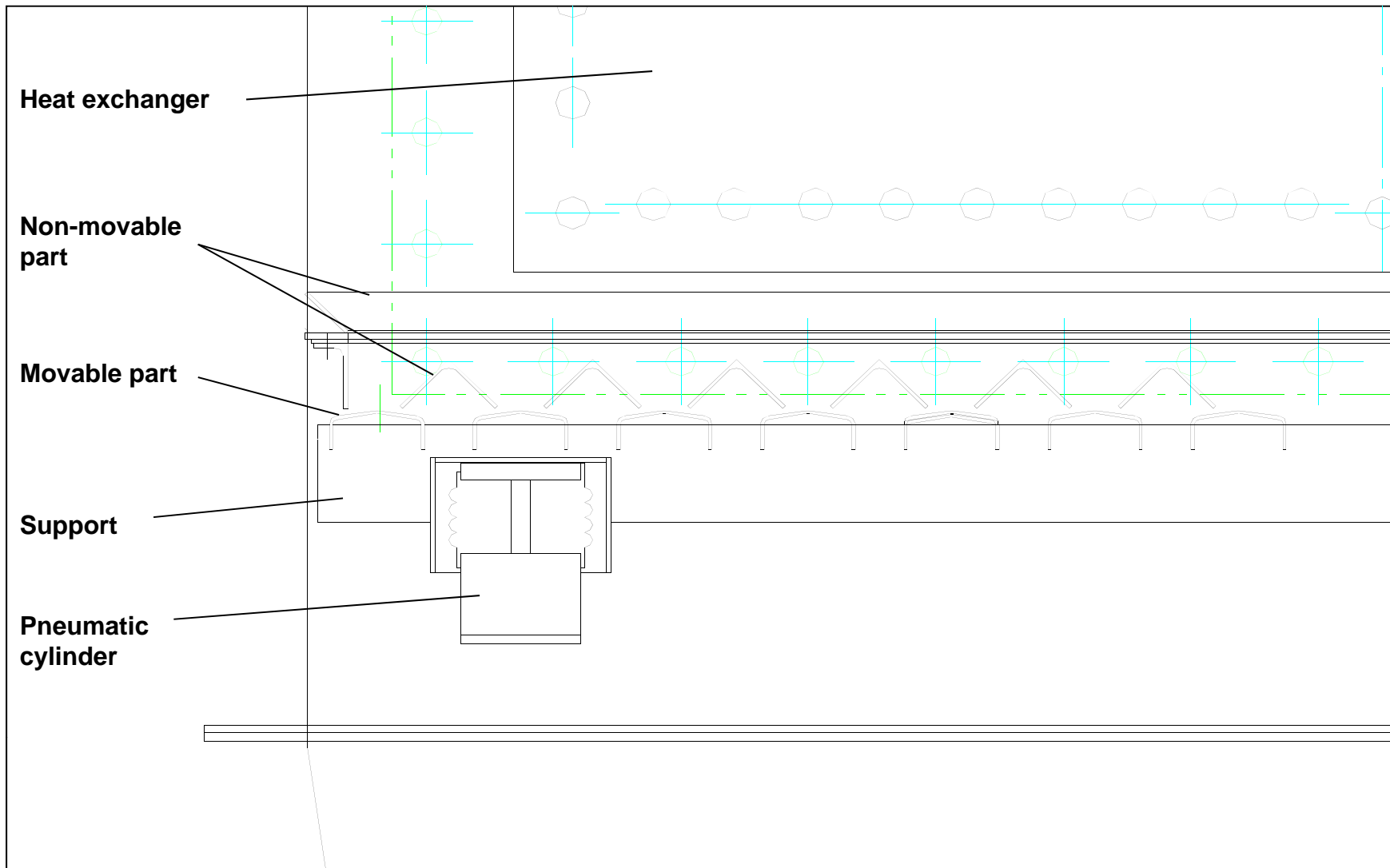
VFC – Vertical Fluidized Bed Conditioner

Principle of sugar flow



VFC – Vertical Fluidized Bed Conditioner

Air distribution and discharge plate



VFC – Vertical Fluidized Bed Conditioner

Air distribution and discharge plate



← Non-movable part

← Movable part

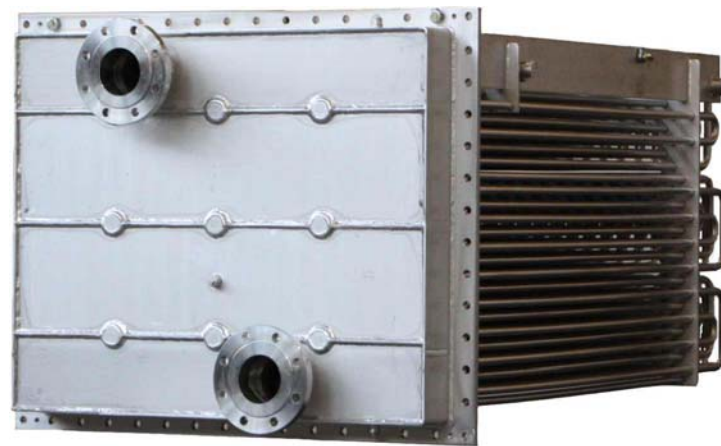


Pneumatic actuation

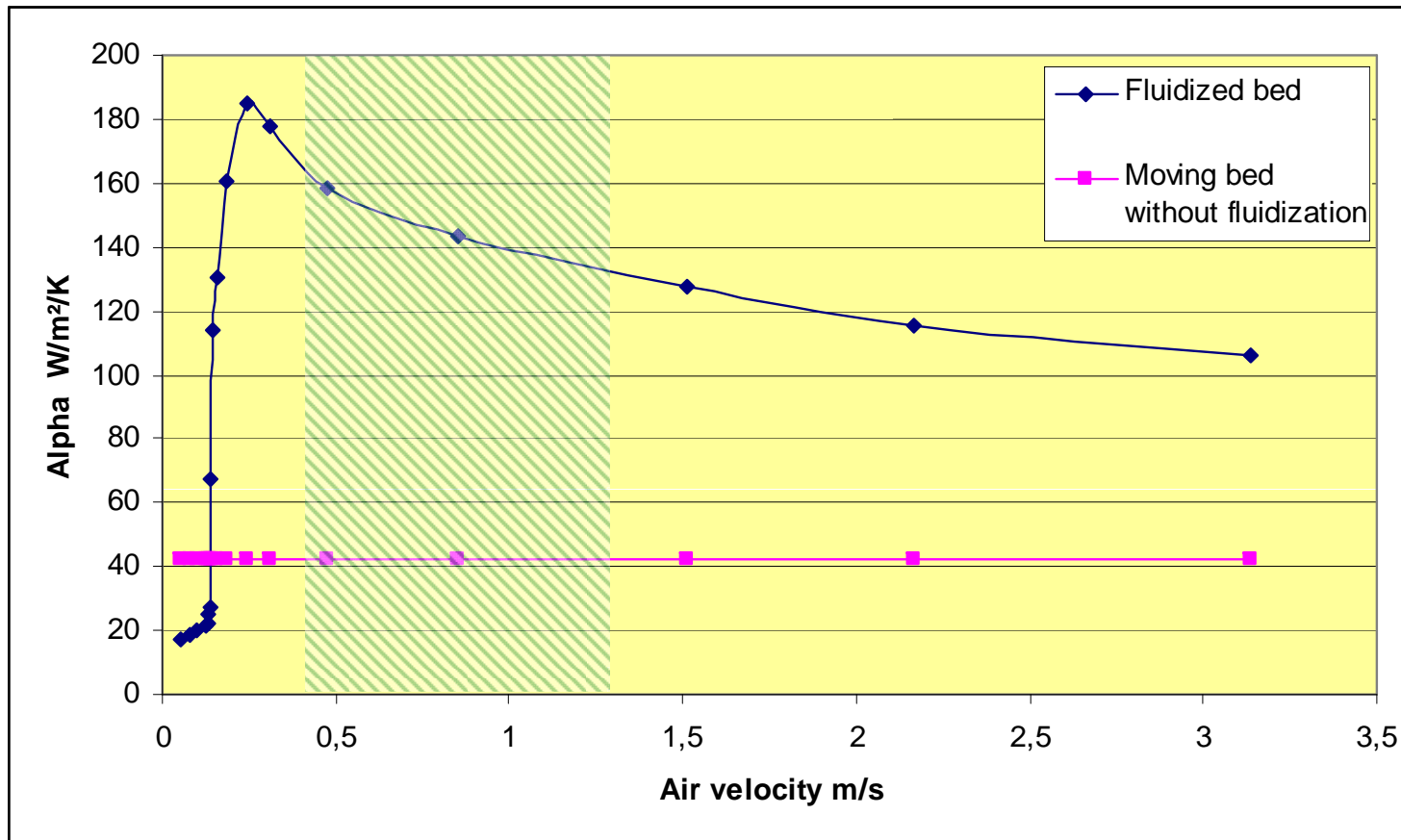


Internal Heat Exchanger

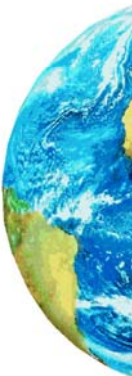
- q *Well-proven standard unit*
- q *Modular design*



Fluidized or Airless Moving Column System?



q Heat transfer rate is 3 to 4 times higher with Fluidization



VFC – Vertical Fluidized Bed Conditioner

Result of constant development focused on

- ☞ *Sugar quality in terms of residual moisture*
- ☞ *Reduction of unit size and the demand for process air by introducing water-cooled heat transfer units to the product compartment .*
- ☞ *Changing from horizontal to vertical design*



VFC – Vertical Fluidized Bed Conditioner

The solution...

- q *... in new factories*
- q *... for production increase in existing facilities*
- q *... as standalone solution between curing and loading*



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Thank you for your kind attention!