

**LILLA**  
No one else

# Gazette

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**SCAA 2013 TRADE  
SHOW, A GREAT  
SUCCESS**

**TECHNICAL SUPPORT  
AT IT'S BEST**

**CAFÉ SOLUBLE  
ACQUIRES A NEW  
SMART ROASTER**

**LILLA HAS PARTICIPATED  
OF TEA & COFFEE TRADE  
SHOW IN SINGAPORE  
FEB/2013**

## **Technical Article**

**Roasting coffee, control is the key,  
but what to control?**



## Exhibits

# SCAA 2013 TRADE SHOW, A GREAT SUCCESS

At the week of April 11st to April 14th, the Company Lilla attended the SCAA Expo 2013 which took place in Boston, United States.



During the 2013 SCAA show our engineering experience was once again on display as we presented Lilla's unique coffee roasting technology capabilities.

Under our NO ONE ELSE banner we highlighted Lilla's one of a kind solid drum convection roasting technology.

Present with us was our local sales agent, Ed Lane, who helped us present a new generation of roasters known as the 4G technology

With a show of confidence in Lilla's products,

Boston's biggest coffee roasting company finalized the purchase of a Lilla Smart 2000 during the 2013 SCAA show in Boston.

We are thankful for the numerous customers from throughout the world who stopped by our booth during the 2013 SCAA show in Boston.



Thank you once again for your visit.  
We wish all the best and great success looking forward to an even better show in 2014.

# TECHNICAL SUPPORT AT IT'S BEST

**Lilla through the years, has being developing its roasters design, and most important, its quality.**

Since 1918, Lilla has been offering prime quality roasting technology to the coffee market. Vital to Lilla's success is good technical support to our customers. Lilla's tech support department is led by **Mr. Bruno Missiato**, a veteran roasting technology expert.

**Mr. Missiato** leads a team of thirteen technicians who are available through Lilla's 24/7 tech support line. Our tech support team travels throughout the world commissioning new roasters and providing support.



Says Bruno Missiato about his team work

I have been working at Lilla for 06 years now, heading the Technical Assistance Department for 02, and when I first start to think about, what I was supposed to write for this Gazette issue, 02 words automatically come to my mind: Responsibility and Friendship.

It was really amazing, when I realized how huge was to provide support for thousands of customers, located over 60 countries, 24 hours a day, 7 days a week. I mean, what really matters in this kind of business, is not so much, how long or how hard my team works,

but whether, the team is reliable and functioning well most of the time, this is the essence of it.

In the other hand, I believe that to achieve our customer's satisfaction, the Technical Assistance Staff, must be composed by people who personalize, responses and is fluent with our products, basically, these people become the face of Lilla before our customers, and from my perspective, I couldn't have asked for a better team, who became my friends.

So, that is it, keep counting on us for 24X7!!!!

## THIS IS THE LILLA'S TECHNICAL SUPPORT TEAM



# TESTIMONIAL



**Santiago Carrasco**  
PRODUCTOS MINERVA | ECUADOR

I have had Lilla roasters for several years and can comfortably say that Lilla's technical support is very good and effective. Every time I have needed support, Lilla's team has been very professional and efficient.



**FRANK HEESELS** | PLANT MANAGER  
DANKAFFE | MALAYSIA

At Dankaffee we have equipment from different suppliers. Lilla is one of the best in terms of technical support. Lilla's team is very effective even from afar off in Brazil. Lilla's roasters are very reliable and when technical support is needed we are very comfortable relying on Lilla's team.

At Porto Rico Importing Company our specialty is roasting 30 different coffee from origins all over the world. Ever week we roast to a multitude of shades. Our customers expect excellence whenever they visit one of our stores or buy coffee for their restaurants and cafes. I have used Lilla equipment for almost 20 years and the equipment is very hard working, breaks down very rarely, and has resulted in making us satisfy our customers with the best of freshly roasted coffees.

The techs that have visited us have been very good and besides being very capable mechanics, they have been knowledgeable about coffee roasting and have helped us solve problems we have encountered while roasting more exotic coffee. In addition we have been able to trouble shoot things over the phone or thru e-mails. They are constantly available and have been very supportive.



**PETER LONGO**  
PORTO RICO IMPORTING COMPANY  
NEW YORK

I purchased my 2 bag roaster almost 20 years ago because of a good recommendation from a friend also in the coffee business. I have been very satisfied with their roaster and their service. They are helpful and reliable. We would not be as successful as we are without Lilla's contribution.

Thanks Lilla!



# CAFÉ SOLUBLE ACQUIRES A SMART ROASTER



**Café Soluble S.A.** in Nicaragua, has recently acquired a new roaster, the Lilla Smart.

Café Soluble S.A. is a point of reference in its market and is now the proud owner of a new Lilla Smart.

Café Soluble S.A. started operations in 1959 when a group of Nicaraguan and North American businessmen decided to roast and export high-quality instant coffee. Since then, the company has placed its own products on the market through its own distribution network. With 450 employees, Café Soluble supplies their local and international markets including neighboring countries Guatemala, El Salvador, Honduras and Costa Rica.



# TEA AND COFFEE WORLD CUP ASIA'S FAIR 2013

During the week of February 28th to March 2nd, Lilla participated of the 2013 Tea and Coffee World Cup Asia Fair in Singapore.



Before the Fair began, we took the opportunity to conduct a workshop for our Sales Team. We had representatives from the following areas: Malaysia, Singapore, Indonesia, Thailand and South Korea.

During the workshop we presented our new 4G technology which elicited quite a bit of interest from all participants.

Many of our existing customers were present at the Fair and many others expressed much interest in our technology. Much work must be done to follow up with all requests. We appreciate everyone's presence wishing great success to all.



## In roasting coffee, control is the key! ... but controlling what?

### PART 1:

#### 1. INTRODUCTION

What is really important to control during roasting so that we can guarantee the quality of coffee beans at the end of the process? To answer this question we must first understand what the roasting process is and why it happens. Then we will be able to identify what are the elements that directly influence roasting. Finally, with this identification, we will be able to know what we should control so that we can lead the roasting of coffee beans according to our goals or according to what the consumer asks.

It is not the purpose of this article to address the different forms of heat exchange that can be used in a roasting process. However, for all the analysis hereby we will always consider the heat transfer done by pure convection. If you want to verify why this is the best form of heat exchange for the roasting quality, you may consult our technical article from our Gazette number 12.

#### 2. WHAT HAPPENS DURING THE COFFEE ROASTING PROCESS?

As the entire roasting process involves heating the product that we roast, we tend to think that the transformation which occurs is primarily physical.

Actually the main changes that happen in the roasting process are chemical. Physical changes that result, only have a secondary role and they are mostly just a consequence of the chemical transformations.

What can be easily seen during the process is that the coffee changes color, size, flavor and starts to release a different aroma than it had when raw. The reasons for these changes are the chemical reactions that occur along the roast.

The substances that existed before are replaced by other elements which are products of the chemical reactions occurring in the coffee.

#### 3. WHAT MAKES THE COFFEE TO ROAST?

##### a. Temperature of hot air:

As previously defined, we will consider only pure convection heat transfer<sup>1</sup>. Therefore the first assumption that comes up to our minds is that the temperature of hot air is the agent which roasts the beans. This premature conclusion comes from the fact that we know that if we increase the air temperature the coffee roasting time becomes shorter. However we must be careful in our assessment because appearances can be deceiving.

##### b. Flow of hot air:

Further analysis will expand our perspective and there is a simple experiment that can help us with that. To perform our experience, we first need a roaster which can keep the temperature of the hot air constant throughout the roasting process.

We also need for this roaster to control the hot air flowing through the roasting chamber.

With this in hand, let's roast in such a way that the temperature is the same throughout the roast and the flow is constant. After that we will do another roast, working with the same hot air temperature, but this time with a greater hot air flow. The result will be a shorter roasting time in the second experiment. Therefore we will conclude that the flow of hot air also influences the roasting process.

Through the reasoning line we draw here, we can try again to answer our initial question by saying that what makes the coffee roast are two elements: the hot air temperature and the speed with which this air passes through the beans.

Will this be the correct and accurate answer?

Is this concept what allows us to have the best possible control over the roasting process?

##### c. Heat transfer:

It is surprising to learn that neither the hot air temperature nor its speed are the direct agents causing chemical reactions which define the roasting process. Actually there is a physical phenomenon associated with the movement of energy, which is heat transfer<sup>2</sup> from the hot air to the beans. This transfer of heat, which is necessary to bring the roasting phenomenon to happen, is a function of the two other variables we are analyzing.

As we will understand throughout this article, this reality, very much changes our understanding about how we use temperature and flow of hot air in an ideal roasting process. Actually the heat transfer is the element that really matters.

This heat exchange is a physical quantity that, in the case of convection between the air and the coffee beans, depends on the hot air temperature, the speed with which it passes around the beans, and the size and shape of the beans.

We are ignoring here some other elements of lesser influence.

The sciences of thermodynamics and heat present us the formula and graphic bellow which allows us to have a better sense of this fact.

$$Q = h \cdot A \cdot (T_{air} - T_{bean})^2 \text{ where:}$$

**H**= COEFFICIENT OF HEAT TRANSFER

**A**= SURFACE OF COFFEE BEAN

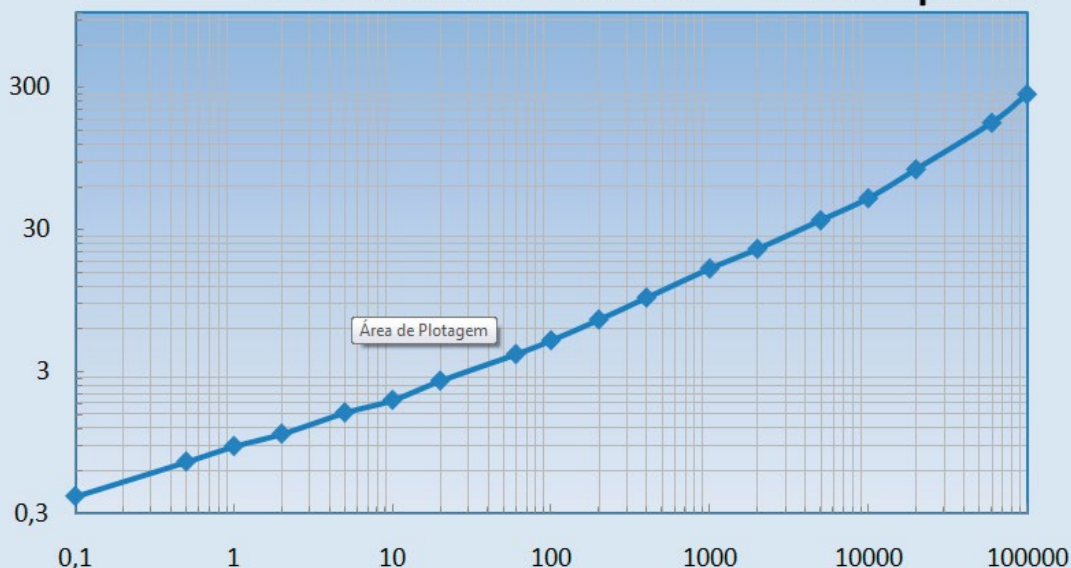
**T<sub>AIR</sub>**= HOT AIR TEMPERATURE

**T<sub>BEAN</sub>**= BEAN TEMPERATURE

The Coefficient of heat transfer (h) is a function of the hot air speed as we can see in the graphic bellow<sup>3</sup>:



## Heat Transfer from Hot Air to a Sphere



### d. What matters is the transfer of heat and not the air temperature:

According to the formula above, the heat transfer is directly proportional to the difference between the hot air temperature and bean temperature. This means that if we increase the temperature of hot air, doubling the temperature difference, then it will also double the heat transfer. Another conclusion that can be drawn is that, contrary to our intuition, the air speed demonstrates to have a stronger influence over the transference of heat, than the variation of air temperature itself. As we can notice in the graphic above, the coefficient of heat transfer ( $h$ ) exponentially grows along with the speed increase.

This means that if we double the hot air flow we will get much more than double the heat transfer.

This physical reality of the great influence of air speed on heat exchange can be felt in our daily lives when we hear from the weather forecast that the temperature at the moment is zero degrees, but the thermic sensation is  $-10^{\circ}$  C. This effect is normally associated with the presence of wind; in this case, the more intense the wind is the more affected our temperature perception will be. It is to say that, with a strong wind, we will think the temperature is much lower than it actually is. This proves that we cannot feel the air temperature as a physical reality. What we feel is the temperature of our body that gets lower in the presence of the cold wind because our body loses more heat to the cold air. We can also pass through an opposite experience to that mentioned above. We may enter into a sauna where the air temperature is around  $85^{\circ}$  C. We sit down and remain quiet and thus the thermal sensation of heat is bearable.

Following we fill our lungs and blow air toward our arm.

We will feel our arm burning over the area where the air passes with speed, as if the air was much warmer than  $85^{\circ}$

C.

The area in contact with the air passing at great speed, exchange more heat and the skin temperature increases, causing the burning sensation. Again, what we can feel is our skin temperature and not the air temperature.

From the scientific point of view, according to the principles of thermodynamics and the practical experiences we suggested, which are consistent with these principles, we have just refuted a great myth. Much has been said with respect to the ideal temperature of the hot air to roast the coffee, but, like us, the coffee bean is not affected by it, but by its own temperature that is controlled by the heat exchange coming from this hot air. A high temperature hot air with a very low flow speed will not roast the coffee bean, as we do not burn our body when we are at rest in the sauna. In both cases the heat exchange is low. On the other hand, a lower air temperature combined with an excessively high flow of air can transfer as much heat as to impair the quality of roasting, providing excessive heat to the beans. With the principles of thermodynamics and heat transfer we can calculate and predict how much heat will be provided the coffee even before performing an experiment.

The fact is that for the coffee bean, it does not matter how hot the air temperature is, but it is essential to know how much heat is being supplied to the coffee.

In our next gazette we will analyze another surprising fact related to the heat transfer and we will demonstrate that what really causes the coffee to roast is its bean temperature.

THIS IS A TEXT DONE BY MR. FERNANDO FERNANDES, EXECUTIVE DIRECTOR OF LILLA

#### NOTES:

<sup>1</sup> See Gazeta Nº 12 having a technical paper on the topic: What is the Best System to roast Gourmet Coffee. This article discusses the different heat transfer systems, comparing conduction with convection, showing the advantages of working with roasters which roast with pure convection. This material can be found on our website.

<sup>2</sup> Fundamentals of Classical Thermodynamics

Gordon J. Van Wylen, Richard E. Sonntag; Editora: Wiley

<sup>3</sup> Heat Transmission

Mc Adams, W. H(Author); Editora: McGraw-Hill Book Company