

AIChESM Chicago Columns

Chicago Section
American Institute of Chemical Engineers
www.aiche-chicago.org



October Meeting Notice

October 13, 2004
Lou Malnati's Pizzeria
6649 N. Lincoln Avenue
Lincolnwood, IL 60712
847-673-0800

Agenda

Cash Bar.....	5:00pm
Dinner.....	6:30pm
Speaker.....	7:00pm
Adjourn.....	8:00pm

Cost

\$20 for members
\$22 for non-members
\$5 for AIChE student chapter members
(see your advisor).

Menu

Pizza Appetizers: Choose from Cheese, Cheese and Sausage, Cheese and Pepperoni

Dinner Salad: Mostaccioli with meat or marinara sauce

Your choice of Chicken Parmesan or Chicken Marsala

Dessert: Individual Chocolate Chip Pizza

Coffee and Soda will also be served

Please include your choices for the pizza appetizers and the chicken dish when making your meeting reservation.

Directions

From the Northern Suburbs:

Take 90/94 East exit Touhy East. Go for about one mile then turn right on Lincoln. Take Lincoln south for about half a mile. Lou Malnati's Pizzeria will be on the left (east) side of Lincoln.

From the City:

Take 90/94 West and exit Touhy East. Turn left on Skokie Boulevard, and make an immediate right on Touhy. Travel about one mile east on Touhy then turn right on Lincoln. Take Lincoln south for about a half mile. Lou Malnati's Pizzeria will be on the left (east) side of Lincoln.

From the City you may also want to take Lincoln all the way to Lou's. Lincoln ends for a bit at Lincoln and Western. Then turn right on Western to start north traveling north on Lincoln.



Reservations

Make your reservations by calling the AIChE Reservation Hotline at 847-588-3323 or emailing evalopez@teianalytical.com. Or register online at www.aiche-chicago.org. Deadline is noon October 8, 2004.

Topic and Speaker

Topic: A Radiation-Based Approach to the Design Planar Solid Oxide Fuel Cell Modules.

Speaker: Dr. Kevin Krist, Gas Technology Institute

The most fundamental way to improve heat management in solid oxide fuel cell (SOFC) systems is to minimize waste heat production through good electrochemical performance. However, at the operating point for most SOFC stacks, chemical, electrochemical, and transport losses result in the production of significant amounts of heat. In the larger systems, this heat tends to increase the stack temperature excessively - unless the stack is cooled with large amounts of excess air that increase the size and cost of system components. In smaller systems, the heat can be lost to the surroundings so rapidly that using insulation to maintain the system in a thermally self-sustained condition is difficult and expensive.

Under the sponsorship of the California Energy Commission (CEC) and in coordination with a DOE Solid State Energy Conversion (SECA) Program with Fuel Cell Energy (FCE), the Gas Technology Institute (GTI) and its partners (see below) are attempting to improve both electrochemical performance and the transfer of stack-generated heat in order to develop an effective module for 10-kW, planar, SOFC systems. The module combines radiantly heated gas flow panels with an improved anode-supported, planar SOFC stack technology under development at Materials and Systems Research Inc. (MSRI) and the University of Utah (U-Utah). Technologix Corporation and Nexant, Inc. are assisting GTI in system design.

As a basis for the 10-kW system, the project is designing, constructing and testing three, sub-scale, 1-3 kW breadboard units - operating on blended gases to simulate hydrogen, natural gas, and reformat fuels. The first sub-scale module has been designed and fabricated. The presentation will discuss the concepts underlying the design of this module as well as the initial test results.

Chair's Corner

Becky Wietting
Chair 2004-05
Chicago Section AIChE

What AIChE Means to Me

I joined AIChE as a student at the University of New Mexico. Our advisor professor was a strong supporter of AIChE. He even arranged a trip for our class to tour several manufacturing facilities. As an officer in the student section, I once got to attend a National Meeting in San Francisco. It was an exciting trip.

After graduation, I was not immediately involved in a local section. The section in my area was not particularly active. I was still a member and attended a continuing education course on Pump Technology. At another time, I attended a Distillation course.

When I moved to my second job about five years later, I joined a very active section called the Southeast Texas Section. I was new to the area, and the section's meetings each month moved to different places across the area. This provided a way for me to learn where a lot of interesting places were, and I also got to meet a lot of neat engineers. I learned about the other companies in the area besides my own. I became a plant contact, and later an officer in the section. I was Vice Chair when I was transferred.

Again, I became involved in a local section. This time it was the South Texas section in Houston. They are a very large section, and I made some great contacts. I was only in the area 9 months before I moved to the Chicago area.

The Chicago Section has been very valuable to me. I have made many friends and have been in progressively increasing officer roles. This year I am finally a Chair of a local section for the first time in my life. It is an honor.

AIChE has kept me up to date with new technology, new trends in chemical engineering fields, provided networking, and has even been an avenue for advertising my employer. I am glad the organization is restructuring so that it will survive and provide benefits to future chemical engineers. It offers many valuable aspects, and I am proud to be a part of the organization.

**Nominations Requested for
the Ernest W. Thiele Award**

The Ernest W. Thiele award is sponsored by BP and recognizes the outstanding contributions to our profession by a Midwest region chemical engineer. This award was established by the AIChE Chicago Section and is presented annually to a Midwest region AIChE member. This internationally recognized award consists of an engraved plaque and a \$1000 honorarium presented at our sectional meeting.

Nomination forms and additional information can be obtained from the Thiele Committee Chair. Completed nominations are due to the committee chair no later than March 01, 2005.

One of the highest honors a distinguished chemical engineer can receive is our Chicago Section Thiele award. Please consider nominating a deserving engineer for this prestigious award.

Jim Simnick
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Wanted: Webmaster

AIChE Chicago Section is planning to provide a web page with links to all of its programming and activities. It will need almost weekly maintenance. Volunteer must be able to develop and maintain a site that allows the chairmen of the various activities to update the site themselves. Host for the web site at this time is GoDaddy. Webmaster will be expected to submit a budget for any expenses related to site maintenance.

This site will be visited by up to 1500 engineers and others outside of the Chicago Section. It will be our main communication for:

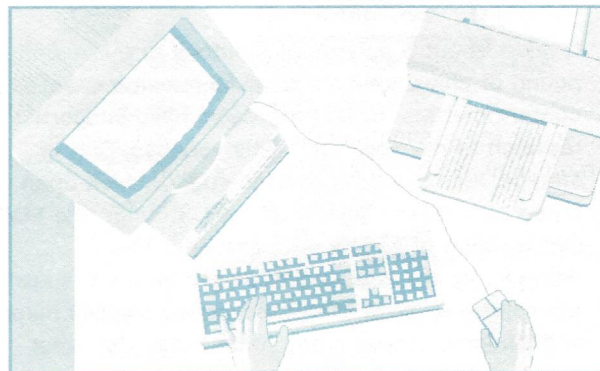
- ◆ Monthly Meetings
- ◆ Networking Opportunities
- ◆ Annual Symposium
- ◆ Student Outreach
- ◆ Government Interaction

Please contact:

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The objectives of the AIChE are to advance chemical engineering in theory and practice, to maintain a high professional standard among its members, and to serve society, particularly where chemical engineering can contribute to the public interest. If you have any questions or comments regarding the newsletter, please contact the editor at clblomquist@sbcglobal.net.

Chicago Section Columns is published eight times a year by the Chicago Section AIChE. Opinions expressed herein are those of the authors and are not necessarily those of the officers of the Chicago Section. Articles for inclusion in the next *Chicago Section Columns* must be received no later than Sept. 24, 2004.



Salty Snacks - Part I

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Oak Park, IL

Salty snacks are popular foods with a long history. The potato chip, for instance is over 150 years old. One can joke that they provide the essential nutrients of fat, salt, and carbohydrates, but in truth, like all other foods, in moderation, they are harmless pleasures.

Potatoes and corn are the major raw materials, and most salty snacks are fried in oil, though some are baked. Most snacks, as packaged, are relatively low density; so tend to be made close to markets to reduce shipping costs. They also have relatively short shelf lives, and so are often delivered directly to stores (store door delivery), as compared to shipping to a warehouse, as is done with most other foods.

Other store door delivery products include dairy, bread, soft drinks, and some cookies and cakes. These products commonly have shelf lives that are relatively short, except for soft drinks. Those are delivered directly because they are so heavy and turnover is so fast that they must be replenished often.

Potato Chips

Potatoes are received in bulk in large trucks, which are elevated on a hydraulic platform so the potatoes can be dumped into water flumes. Potatoes have a long season in the United States, from about March in the South to the Fall in Northern states. They can be stored in large sheds, relying on the natural coolness of the Northern states, such as Idaho and the Dakotas. Stored potatoes deteriorate slowly, so just before the first new crop comes in, the quality may be pretty low.

It takes about 5 pounds of potatoes to make a pound of chips, so even small increments in solids content matters. Large processors have supported research to develop high solids varieties. During storage, starch is converted to sugar, which upon frying can cause chips to be dark, through the Maillard reaction of sugars with proteins. This reaction, by the way, is not always bad -- it is also the source of flavor in roasted coffee, cooked meat, and caramel, among many other foods. For most people, a light colored potato chip is desired.

The other important property of chips is texture, specifically a brittle crunch. Texture is controlled by the time and temperature of frying. High temperatures and short times give a desirable texture to thin chips. Longer times at lower temperatures, even under vacuum, give a stronger, harder and thicker chip.

Potatoes are washed to remove field dirt, peeled by scrubbing with stiff brushes, inspected for bruises and blemishes that may indicate black portions or hollow tubers, and then sliced. A large, continuous fryer will produce about 5000 pounds of chips per hour; so about 25,000 pounds of potatoes are typically processed per hour

Slicing is done in special equipment that whirls the potatoes against knives fixed in a circular cage. The knives last about an hour in service and then are replaced. Spare cages are kept available to minimize downtime. Care is taken to keep stones and tramp metal from the slicers to avoid damage to the knives.

For some products, the knives may be corrugated, yielding corrugated slices. The knives in that case are carefully adjusted so that the curves of the two sides of a slice are actually out of phase with each other, giving a better texture than if all the knives were exactly alike.

The slices fall into water which helps remove free starch. Potato starch can be a valuable product, and some plants recover it for sale. Others allow it to settle and sell or give it away as animal feed. Slices are drained and then fried in continuous fryers. The oil is heated externally and the temperature carefully controlled. A potato chip contains about 30% fat, so the oil is continually replenished. Perhaps once a week, the fryer is emptied and cleaned with caustic. As the oil circulates through a heater, it is also usually filtered to remove burnt fragments of food.

A sophisticated optical instrument inspects the fried chips for color and dark spots. Off-spec chips are diverted by an air blast from one of a row of nozzles. The rejected chips are re-inspected, sometimes by hand and others by the same machine.

Continued on page 5.

Snacks, continued from page 4.

Reduced fat chips have some excess oil removed by contact with superheated steam. Other variations include chips fried in an indigestible synthetic oil and baked chips, made from a dough based on dehydrated potatoes.

Most chips are seasoned with oil by tumbling through a drum. Salt may also be electrostatically applied. Flavors are usually dry powders with salt and such ingredients as cheese powder, chili or other flavors.

Chips must be packaged in opaque materials that are impermeable to moisture and oxygen. Typically they are polymer laminated films with a heat sealable inner layer, a vaporized metal film, and a polyester outer layer for graphics. Packaging is performed on vertical, form-fill-seal machines at a rate of about 100 packages per minute, no matter

the size. This means that it takes many machines filling 1-ounce packages or fewer machines filling one pound packages.

The fillers use a digital scale system in which chips are continuously loaded into 16 buckets. Each bucket is weighed and the combination of 4 or 5 that comes closest to the target weight are opened and dropped to the empty pouch. The precision of the weighing system is so great that accuracy is within the weight of one chip. While the scales are expensive, they are justified by reducing over-filling.

Part II of this series will discuss corn snacks and other products.

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