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SHORT STORIES AS A MEAN TO TEACH CHEMICAL ENGINEERING III

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ABSTRACT
In two previous articles the authors presented how short stories can be used as a mean to teach Chemical engineering. In this new article, they present another story, this time related to air conditioning.

KEY WORDS: *Chemical, engineering, short stories, air conditioning.*

I. INTRODUCTION

The teaching of Chemical Engineering it is not an easy task, particularly the subjects related to Unit Operations. Which is commonly taught through the resolution of problems and field practices that students perform in the laboratory of Unit Operations. The authors have presented a new approach in which short stories related to the topics are used as auxiliary resources in the teaching process. In two previous articles, they presented two short stories: one related with pumps, the other with mass transfer. Now they present a problem related to air conditioning. They hope that the readers can follow the calculations and arrive to the same conclusions that the hero of our story.

II. AN EXAM

The Engineer Roberto B., our professor of Mass and Energy Balances, begins to describe the problem for the final exam:

> *Hot air is used to dry a mineral parting from an initial humidity level of the 10 percent until a two percent of final humidity is reached. The dry air must be produced from atmospheric air at 20°C, a dew temperature of 14°C and a quantity equal to the air that comes out of the dryer.*

To prevent people from cheating on the exam, our clever teacher asked us to sit leaving an empty chair between each of us. However, I was still next to my friends.

> *The air mixture is transferred into a heater, and then is ready to enter into the dryer. It's an adiabatic dryer. The dryer's exhaust air is at 45°C and has a humidity of 0.04 kilograms of water vapour per kilograms of dry air.*

I take notes as fast as I can, making almost intelligible scribbles to catch every detail mentioned by the professor.

How many cubic meters of fresh air would be necessary per every thousand kilograms per hour of input material?

At what temperature the air must come into the dryer?

Which are the air conditions of the mixture?

How much water evaporates? How much warmth must be transferred to the preheater?

"Well, that's all," says the teacher. "Good luck. You have two hours to find the solution to the problem. You can't use your notebooks, books, or any reminder, just the psychometric charts and the sheets of paper I gave you. If you need more sheets, please, let me know. If I catch any of you trying to cheat, I will take your exam from you and crush you with "la *quebradora*"[1]. Got it?"

We nod in silence. What else could we do? He is the great Tlatoani[2]. He makes the rules, despite how absurd they might seem. Besides, he is big, burly and has a bulldog face. I heard he was a professional luchador.

"Maybe he is 'El Santo'[3]" told me once "*El Sombras*".

I read again the problem and stare fixedly at the empty sheet in which I have to write the answer. I could shift it for another one, but that wouldn't change a thing. All of them are waiting for my rationales and my numbers, but first I have to fill the first of one and destroy the even pallor of that white desert. I must break the silence inside my head with an original idea, and give it form, work on it.

I need a sign, a clue, an advice, a suggestion that helps me to develop something. Where is that clue? I keep staring desperately at the white sheet. Maybe there it is. There, in the watermark. I'm going crazy. Who took my imagination away? Why I can't come out with any ideas?

I'm getting nervous. My hands sweat and the pen slips from my fingers. I breathe deeply trying to relax and look at my classmates.

"*El Indio*" is sit in front of me. He is typing something swiftly on his calculator. "*El Niño*" writes something on his sheet of paper. "*El Sombra*" checks the psychometric chart the professor gave to us. Everybody is doing something and I still don't have a clue!

"Indio," I whisper. "You have anything? Please, tell!"

He shakes his head and shrugs.

If I had a book or my notes I could look for a clue or a similar problem and discover how to get the answer.

Uneasy, I look at to both sides.

I'm scared. The professor is looking at me.

I smile, even though my stomach is now hurting.

I stay still and try to focus. I read the problem again.

I remember what the professor said once: "First we have to draw a scheme of the process".

I follow that advice and start drawing devices and currents. Then I write the available data on the scheme [1]. This makes me feel better and gives me the first clue. I look at my watch. Half an hour has passed.

I take the humidity chart that the professor gave us to get the temperatures and the humidity [2]. Then I draw the line that joins both kinds of air and locate the mixing point: "38°C". Parting from there, I get the preheating temperature: "90°C" and the wet-bulb temperature in the dryer: "42°C".

"Great! Now I just have to calculate the balances," I think. I make my calculations as fast as I can and write the results.

Three sits behind me, "*El Oso*" stands up and asks for permission to go to the bathroom. Suddenly, when he passes by my side, he snatches the exam from my hands. I want to scream and knock him down to retrieve it, but I contain myself. If I make a fuss, the professor will send us both out. Besides, probably "*El Oso*" will beat me unconscious after that. Son of a...! I swallow the anger and the stomach ache comes back. I must do everything once more. I look at my watch. I have less than an hour left!

I draw the diagram all over again; calculate the humidity and finally, the mixing point for the airs: "32.5°C".

What?! Surely I made a mistake. I did everything too fast and the anxiety was killing me. The first time I got "38"! I review all my calculations carefully.

No, it's alright. The mixing temperature is "32.5°C"; therefore, the preheating and the wet-bulb temperatures must be 75 and 37.5°C, respectively. [3][4]

Ha-ha That dick screwed himself! "*El Oso*" is too stupid to notice the mistake! That thought makes me so happy that the stomach ache is gone. I wish I could shout "You are fucked, prick!" on his face.

Now that I feel all relaxed and happy, I can finish the rest of my calculations. In less than half an hour, I'm done. I turn my head and see everybody still working on their exams. I'm anxious again. But if it was so simple! What if I did it wrong? Maybe I shouldn't handle it to the professor yet. It's better to

[1] Famous wrestling move in Lucha Libre

[2] Ancient nahuatl ruler.

[3] 'The Saint', famous Mexican Lucha Libre wrestler (luchador).

check everything all over again. You never know. I still have some time left, anyway.

Step by step and calmly, I confirm my rationale, the calculations, the obtained data on the psychometric chart, and my final results. Five minutes after, I have no more doubts. I did it! I'm getting an A+!

I make sure that my name is well written in every sheet. Then I fold the exam and stand up. When I pass close to "*El Indio*", he whispers:

"Give me a clue, bro! Don't be selfish!"

With dissimulation, I let fall next to him the piece of paper in which I wrote my rationale and some calculations. I step in front of the professor.

"So, how was it?" he asks grinning in a rather intimidating way.

"I think not that bad, professor. Thank you very much."

"See you!" he says shaking my hand so hard that it hurts. "And I hope you haven't helped any of your little friends. I got you spotted, Sir! If I smell something fishy, I'll bring you down."

"Ha-ha. See you, professor!" I say with a knot in the throat and a severe pain on the stomach.

III. CONCLUSIONS

There are numerous techniques that teachers use to attract student's attention in Chemical Engineering classes. This article and the other two already published ([5], [6]) shows a technique based on the resolution of problems through short stories. After employing this technique over several semesters at the University, the authors believe that this procedure improves learning by making it more attractive and fun to students.

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