

I. IDENTIFICATION DATA

Title of thesis:	Coffee beans dryer for decentralized purposes
Author:	Eduardo Duque Dussan
Thesis type:	diploma
Faculty/department:	Faculty of Mechanical Engineering
Department:	Department of Process Engineering
Opponent:	Ing. Pavel Filka, CSc.
Opponent affiliation:	IFP Process Engineering s.r.o.

II. EVALUATION OF THE PARTICULAR CRITERIA

Assignment	Demanding
<p>Interesting and unusual assignment concerning very simple design, low capacity, and low manufacturing costs, acceptable for small farmers in South America. Such thesis are useful for further students solving socio-economic and hygienic aspects of food processing equipment design, useful are also for future activities of the thesis author in his homeland.</p> <p>If an assignment in mechanical engineering contains equipment design or plant design/engineering, the individual steps to be solved by the thesis should be exactly specified. The equipment design or project engineering of process plants has a lot of generally established steps (i.e. feasibility study, basic engineering, detail engineering, as the stages of project documentation), and each step has a precise and well known specification.</p> <p>This remark does not mean that it was a fault of this diploma candidate.</p>	

Fulfilling the assignment	Fulfilled with minor exceptions
<p>A professional fulfillment of such a task should include a special approach in both equipment design and economic evaluation. This would be an interdisciplinary work, too complicated for thesis. Concerning the design of a low-cost equipment, three basic construction methods of small equipment could be compared: „Tinsmith Construction“ or Chapistería (i.e. no welding), as used in air conditioning, „Locksmith Construction“ or „Machine Manufacturing technology“ as used in advanced industries. The last one could be very competitive on the market if manufactured in higher numbers.</p> <p>My remark: a comparison of three possible construction methods, comparing their manufacturing costs (or simpler, their total weight) would be an interesting outcome of the study.</p>	

Selected solution procedure	Correct
<p>The necessary stages and parts of the diploma work were elaborated correctly: the analysis of the actual state of the art (pages 7 – 33), calculation concerning mainly flow and heat transfer (pages 34 – 121), conclusions (122), bibliography (124 – 125), list of 103 figures and 5 tables, two appendices, and 11 drawings. These drawings belong mainly to the project stage “Detail Engineering”. Some parts of the “Basic Engineering” – Process and Flow Sheets – were included into the text part as Fig. 101 (designed process) and Fig. 102 (future development).</p>	

Professional level	B
<p>Both technical and graphic levels of the work are very good, as well as the knowledge of physical principles of the process of drying and the orientation in specialized literature.</p>	

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Formal and language level, scope of work	A
The formal and graphic levels are excellent, the scope of the work exceeds the demand.	

Source Selection, Correct Quotation	B
The majority of the relevant sources is of Latin-American origin and in Spanish language. This is correct, because Brazil and Colombia are the leaders in quality coffee production. Quotations are correctly used.	

More comments and ratings	
I would like to explain, why I deviate in some points from the rating "Excellent".	
Drying systems	
The work contains mainly drying of grains in fixed bed dryers. There are more drying systems, which could be used in the case of small equipment design, e.g. fluidized bed. It would be highly interesting to compare the feasibility and rentability of such equipment.	
Very useful for the basic engineering of a drying process using hot air or combustion gases is the graphic presentation of the process using the enthalpy diagram of hot wet air or the mixture with combustion gases. Rather confusing is the diagram presented on the 1 st page of Appendices. The red lines there are not marked nor explicated. The first red line from the top – the last in the process illustrated there – is in reality an indirect cooling of hot wet air characterized by constant absolute humidity. The previous line could mean the heating of wet air with increasing absolute humidity, occurring for example during combustion. It looks like a confusion of pictures.	
Drying systems are generally completed by a separation of dusts and particles from the exhaust air/gas. It could be carried out very simply e.g. by textile sleeves. It depends on the level of both, human health and environment protection in the area.	
Equipment design, drawings.	
The drying plant, as designed on the blueprint 001, is not easily transportable, because uses two different support systems, 3 legs for the dryer and an independent support of the fan unit. Statically it is an "indefinite construction", because all parts between the fan and the dryer are welded together. In such a case, a common support should be used, completed with vibration absorbers.	
Question	
Explain the drying process described in your Fig. 101 (red lines and yellow dots) using the h-x diagram. Important points: fresh air, combustion gas, the line illustrating the mixing of air and gas and defining their ratio to reach the temperature required of the mixture, the line of adiabatic air/gas cooling during drying, thermal losses during drying.	



III. TOTAL EVALUATION AND PROPOSAL FOR CLASSIFICATION

I am evaluating the thesis from the professional point of view, as it would be evaluated in the industry. I understand that the diploma work is limited by many circumstances. **Therefore, I suggest the total evaluation as "B very good".**

Prague, June 17, 2019

Ing. Pavel Filka, CSc.