RECP Best Practice Catalogue

Install shutters at both ends of extruded potato chips tumbler oven

Developed within the framework of MED TEST II

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UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

switchmed

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SECTOR:	**Food & Beverage**
SUBSECTOR:	Processing and preserving of fruit and vegetables
PRODUCTS	Potato chips
CATEGORY	Process control or modification
APPLICABILITY	Process

COMPANY NAME	NOT DISCLOSED
COMPANY SIZE	SME

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Description of the problem (Base scenario):	The raw extruded potato pellets go through a rotary drum tumbler oven where they are tumbled and baked. The oven is made of a stainless steel cylinder of 80 cm diameter open on both sides. Along the longitudinal axis of the drum is a bank of electrical resistances over its full length at a tilt from the vertical of 50 degrees facing downward so the pellets are directly exposed to the source of heat. Most of the baking is done through radiant heating. (See figure 1 below) Much heat is dissipated from the oven as hot air and radiation, because of the openings at both ends of the oven which allow excess free air movement and exposure of the internals of the oven to outside surfaces which facilitates radiant heat exchange. This leads to waste of resources. Thanks to the information system installed at the early stages of the MED TEST II project, the electricity consumption of the oven has been measured at 111,000 KWhre/year. Electricity used for heating purposes is a real waste of resources therefore any savings achieved in this application are a real gain.

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Description of the solution	The proposal is to install shutter screens on both sides of the oven with following characteristics; - Unobstructed movement of the tumbler drum - Unobstructed movement of the flow of products - Easy inspection of the internals of the oven - Do not represent any safety hazard to operators - Do not allow moisture build up in the oven which may affect the quality of the product. Based on above, easily removable temperature resistant perforated plexiglass boards are proposed to be installed at the inlet and outlet openings of the oven, the boards which are 5 mm thick do not weigh more than 3 kg each. The perforations will allow some air movement to control moisture level in the oven. The plexiglass boards will obstruct most radiation heat transfer from the hot internals of the oven that can have direct exposure to surfaces outside the oven. See figure 1 below for details

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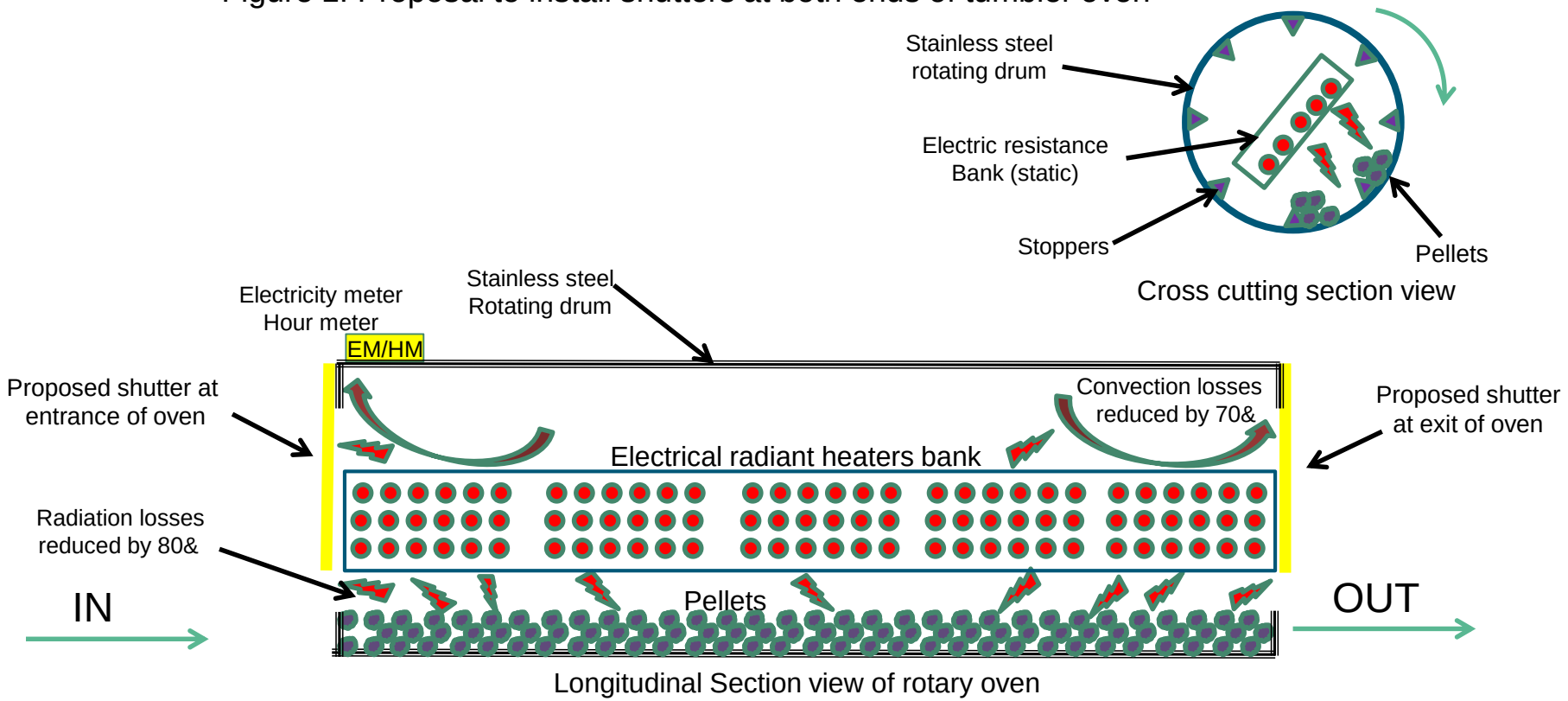
Figure 1: Proposal to install shutters at both ends of tumbler oven



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Economic Benefits	Base case electricity consumption of oven during monitoring period: 111,000 Kwhre/year Estimated percentage energy loss to outside by convection due to openings: 6% Estimated percentage energy loss to outside by radiation due to openings: 4% Estimated reduction in losses by convection and radiation with screen installation: 70% Estimated percentage reduction in energy losses with screen installation: (6% + 4%)*70% = 7% Expected electricity consumption reduction after improvement: 111,000*0.07 = 7,800 Kwhre/year Cost of electricity at plant: 0.140 EUR/Kwhre Base case average cost of electricity to operate oven : 111,000*0.140 = 15,540 EUR/year Expected average savings after improvement: 7,800*0.140 = 1,100 EUR/year
Environmental Benefits	Specific CO2 emissions of electricity grid: 1 kg CO_2/Kwhre Base case CO_2 emissions: 111,000 *1 = 111,000 kg CO_2/year Estimated Avoided CO_2 after implementation: 7,800*1 = 7,800 kg CO_2/year Avoided CO_2 emissions in percentage: 7%
Health and safety impact	Not applicable

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Capital investments & financial indicators	Cost of intervention: EUR 200 Return on investment (simple payback): 0.2 year
Suppliers	Not applicable, no special equipment is required
Other aspects	- Accurate actual electricity consumption figures were obtained thanks to the information system installed by the company at the start of the project at the request of the MED TEST II team. The measuring device installed related to this intervention is an electricity/hour counter meter at the electricity feeder of the oven Readings were taken on a daily basis - Above calculations are based on production period between September 2016 and September 2017
Implementation	Measure has been retained by company for final study, implementation not expected before 2019