Proposition and Resolution of a New Industrial MOOP using Evolutionary Algorithms

Mostapha EL JAI
EuroMed School of Civil Engineering
Euromediterranean University of Fez
Fez, Morocco
m.eljai@ueuromed.org

Iatimad AKHRIF
Civil Engineering Department
Faculty of Sciences of Engineering
Prived University of Fez, Morocco
akhrif@upf.ac.ma

Hussain BENAZZA
Industrial & Productique Department
Ecole Nationale d'Arts & Métiers de Meknes
Moulay Ismail University
Meknes, Morocco
hbenazza@yahoo.fr

Noureddine SAIDOU
INSA-EuroMed
Euromediterranean University of Fez
Fez, Morocco
n.saidou@ueuromed.org

Abstract

In industrial area, it is obvious to proceed to the multidimensional analysis regarding the different enterprise functions. Production, Maintenance, quality, finance… are all sub-domains that are included in the manufacturing process analysis. In a previous article (El Jai et al., 2015), we have established a new analytical formulation of the interdependence between the productivity and the reliability (Pocaccia, 2009) of a given equipment in order to maximize each objective function taken into account (productivity and reliability). The modeling converges to an interesting MultiObjective Optimization Problem (MOOP) (El Jai, 2016). Using some data from semiconductors industry for the simulation of our model, the MOOP proposed proves to be non-linear, not globally convex and constrained by some technical or financial constraints. The paper proposed here tries to discuss the resolution of this new MOOP by MultiObjective Evolutionary algorithms (Deb, 2002). Different formulations have been used for the processing of the resolution and for the extraction of the Pareto front. The findings of each method are presented and discussed in order to weight the most important results.

Key-words:

Evolutionary Multiobjective Optimization, Production, Maintenance, Reliability.

References

Deb, K. (2001), Multi-Objective Optimization using Evolutionary Algorithms, Whiley.

El Jai, M., Akhrif, I., Herrou, B. and Benazza, H. (2014) Correction of the Production Master Plan According to Preventive Maintenance Constraints and Equipments Degradation State. Engineering, 6, 274-291. doi: 10.4236/eng.2014.66032.

El Jai, M., Taking into account the multiobjective aspect in the modeling of industrial systems: holonic approach and multiobjective optimization thesis dissertation, Sidi Mohamed Ben Abdellah University, Fez, Morocco, 29 oct. 2016.

Pocaccia, H. (2009) Introduction à l'analyse probabiliste des risques industriels in Techniques et Documentations, Lavoisier, Paris.

Short biography:

M. EL JAI: graduated as Arts & Métiers Engineer on 2007, Industrial Engineer till 2010, Engineer-Lecturer at ENSAM-Meknes in material and Process engineering from 2010 to 2017, phD in industrial Engineering on oct. 2016, Assistant Professor in Euromediterranean University of Fez-Morocco since oct. 2017.

I. AKHRIF: graduated as Arts & Métiers Engineer on 2010, Engineer-Lecturer at Université Privée de Fès-Morocco since oct. 2015, phD in material and Process Engineering and Sciences on nov. 2017, Assistant Professor at the same university since April 2018.

H. BENAZZA: phD in Mathematics and Computer Science from Claude Bernard University-France on 1995, Professor at ENSAM-Meknes, Moulay Ismail University-Morocco since 1998.

N. SAISOU: phD in Mathematics on 2002. 10 experience in Rimouski University-Quebec. Professor at Euromediterranean University of Fez-Morocco since 2015.