CIRRELT

SÉMINAIRE CIRRELT / MITACS SEMINAR

LE MARDI 6 JANVIER 2009, À 14H00
TUESDAY, JANUARY 6, 2009, AT 14:00

SALLE 5441 / ROOM 5441
Pavillon André-Aisenstadt Building
Campus de l'Université de Montréal Campus / 2920, chemin de la Tour

CONFÉRENCIER/SPEAKER

MIKAEL RÖNNQVIST, Norwegian School of Economics and Business Administration
Bergen, Norvège/Norway

TITRE/TITLE

A new method for robustness applied to rolling horizon planning for a set of heating plants

RÉSUMÉ/ABSTRACT

This seminar integrates two important areas of research and development. The first area is applied and considers the increased use of heating plants to provide energy (both electricity and heat). The second area is more theoretical and considers the development of a new method in robust planning. To provide heat energy, an increasing number of heating plants are being built. To insure their fuel supply, the heating plants award contracts to one or several entrepreneurs through a competitive bidding process. A contracted company is obliged to deliver a certain amount of energy, specified in MWh, for each time period (normally one month). Several fuel types that can be used in the heating plants exist, and one important type is forest fuel. The contracts typically cover one year but there is a possibility to change the level of consumed energy depending on the weather conditions, e.g. temperature, on a monthly basis. The transportation and storage costs are large and it is important to use an efficient supply chain where terminals and different transportation and chipping systems are planned integrated.

In order to deal with the uncertainty in contract levels for the energy consumption we propose a new solution approach where we want to make decisions in the first time period such that in reduces the affect of the worst case scenario. The methodology is based decomposing the problem into two separate problems. In the upper level problem we make business decisions i.e. decisions that will be implemented in the business process. The lower level problem finds the anticipated worst case solution given a business solution. This information is given back to the business planning model as a valid inequality integrating potential business solutions with worst case scenarios. These two problems are iteratively solved until the business solution satisfies the constructed valid inequality from the anticipation model. The business model is a LP problem whereas the anticipation model is a bilinear problem. The latter is solved with a heuristic approach.

We consider problems where we have an uncertainty with the following properties. The first two properties are that the uncertainty is limited into lower and upper bounds and that there is no assumption on the underlying distribution functions. These properties are used in standard robust planning. The third is generally not addressed and states that the overall uncertainty is limited. A typical example in our application is when one month could be warm and the second cold. The energy consumption then varies a lot. However, over the full winter the overall energy consumption is stable. The result shows that the approach provides solutions that outperform a standard deterministic approach where predetermined safety stock levels of the inventory are used. The solution approach is also efficient as it only need to solve sequences of LP problems of the same size (or smaller) as the deterministic approach.

RESPONSABLE/ORGANIZER : Bernard Gendron, 514 343-7240

UNIVERSITÉ LAVAL · UQÀM Université du Québec à Montréal · HEC MONTRÉAL · ÉCOLE POLYTECHNIQUE MONTRÉAL · Université de Montréal