

## Using integer programming to solve the machine scheduling problem with a flexible maintenance activity

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### Abstract

This work addresses the single machine and parallel machine scheduling problems, where machine is flexibly maintained and mean flow time is used as a performance measure. Machine  $M_k$  should be stopped for maintenance for a constant time  $w_k$  in the schedule. The maintenance period  $[u_k, v_k]$  is assumed to be set in advance, and the maintenance time  $w_k$  is assumed not to exceed the maintenance period (that is,  $w_k \leq v_k - u_k$ ). The time  $u_k$  ( $v_k$ ) is the earliest (latest) time at which the machine  $M_k$  starts (stops) its maintenance. Two cases, resumable and unresumable, are considered in the single machine and parallel machine problems, respectively. Moreover, four integer programming models are developed optimally to solve the problem.

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**Keywords :** *Scheduling, maintenance, integer programming, single machine, parallel machine.*

### Symbol definition

$J_i$  job number  $i$ ;  
 $M_k$  machine number  $k$ .

### Problem parameters

$M$  a very large positive number;  
 $n$  number of jobs for processing at time zero;  
 $m$  number of machines in the shop;

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