

IMSE 500 Models of Operations Research

Workforce Management Project

Employee absenteeism is a significant concern for the UMD manufacturing company to maintain its assembly line. Because of unpredictable absenteeism, the UMD is facing a complex workforce management problem. Since the assembly line seriously understaffed has to be shut down, the UMD has to hire much more employees than needed actually. However, overstaffing wastes labor forces and charges higher labor costs. The UMD is currently engaged in multiple research projects for better understanding employee absenteeism and optimizing workforce planning and scheduling strategies.

The UMD assembly line consist of seven sections (A ~ G), and each section is operated by a team. The data of daily operations are given in the three EXCEL documents - all_team_att.xlsx, all_team_skills.xlsx, and all_team_prior.xlsx.

(all_team_att.xlsx): This EXCEL file records employees' daily attendances from 01/04/2016 to 09/05/2018. Workdays in a week are from Monday to Thursday.

	1/4/16	1/5/16	1/6/16	1/7/16	1/11/16	1/12/16	1/13/16
1001	1	1	0	1	1	0	1
1002	1	1	1	0	1	1	1
1003	1	1	0	1	1	1	1
1004	1	1	0	1	1	1	1
1005	1	1	1	1	1	1	1
1006	0	1	1	1	1	0	1
1007	1	1	0	1	0	0	0
1008	1	1	1	1	1	1	1
1009	1	1	1	1	1	1	1
1010	1	1	1	1	1	1	1

- Row names are employee IDs
- Column names are dates.
- If an employee shows up before the starting time 7:00 a.m. on a certain day, s/he is assigned a value "1", otherwise "0".

(all_team_skills.xlsx): This EXCEL file gives intra-team versatility matrices.

	A1	A2	A3	A4
1001	0	0	0	0
1002	0	0	0	0
1003	0	1	0	0
1004	1	0	0	1
1005	0	0	0	1
1006	1	1	1	1
1007	0	0	0	0
1008	0	0	0	0

- Row names are employee IDs
- Column names are workstation titles. For example, A1 is the first workstation in Section A of the assembly line.

- If an employee is capable of running a workstation independently, s/he is assigned a value “1” for this workstation, otherwise “0”.
- The last two columns in each sheet, filled in yellow, are production leader and tag relief, respectively. A production leader and tag relief should be able to operate all workstations in their section. The production leader is responsible for the operation of the section, monitoring any issues and ensuring production targets. The tag relief exchanges another employee when s/he needs a break.

(**all_team_prefer.xlsx**): This EXCEL file gives a plant manager’ preference for job assignments.

	A1	A2	A3	A4	A5	A6	A7
1001	0	0	0	0	0	0	0
1002	0	0	0	0	0	0	0
1003	0	1	0	0	0	0	0
1004	0	0	0	0	0	0	0
1005	0	0	0	1	0	0	0
1006	0	0	0	0	0	0	0
1007	0	0	0	0	0	0	0
1008	0	0	0	0	0	0	1
1009	0	0	1	0	0	0	0
1010	1	0	0	0	0	0	0

- Row names are employee IDs
- Column names are workstation titles.
- The plant manager prefers to assign employees to workstations valued “1” if possible.

The UMD needs to avoid the understaffing risk and reduce the overstaffing cost. The plant manager is considering how to adjust day-to-day job assignments according to who show up before the starting time 7:00 a.m. and how to increase employees’ versatilities by cross-training. There are six rules of assignment that the manager should obey as follows:

- Employee versatility.** The file all_team_skills.xlsx tells the employees’ versatile skills. Each workstation can be run either by an employee himself/herself who is labeled “1”, or by two employees labeled “0” working together.
- Assignment priority.** It is an emergency if there are no enough showing-up employees to run all the workstations in the assembly line on a certain day. The manager can disobey all the rules below ((b) ~ (f)) to keep the assembly line running. For the emergency case, the manager could not assign employees to the positions of production leaders.
- Team independence and collaboration.** Each team first assigns the members to complete its own tasks. If there are employees more than needed, unassigned ones can be lent to other teams.
- Assignment preference.** If there are enough showing-up employees to run the assembly line, the manager would like to make an assignment according to his/her preferences given in the file all_team_prefer.xlsx.
- Go-home policy.** Every showing-up employee is fully paid \$320 per day and absentee is not paid. If showing-up employees are more than needed, the manager could ask some unassigned employees to go home in order to reduce labor cost. The go-home employees are paid \$160 that day.

- (f) **Cross-training policy.** Cross-training is an alternative to the go-home policy. Cross-training can increase employees' versatilities so that more workstations can be operated by single skilled employees in the future assignment. The manager may prefer to provide cross-training courses for unassigned employees rather than send them back to home. A cross-training course requires a trainee to work with a skilled trainer for two days to learn a new job. A trainee will also be fully paid.