Gentor – Optimization Model

C. ALP UZUNER

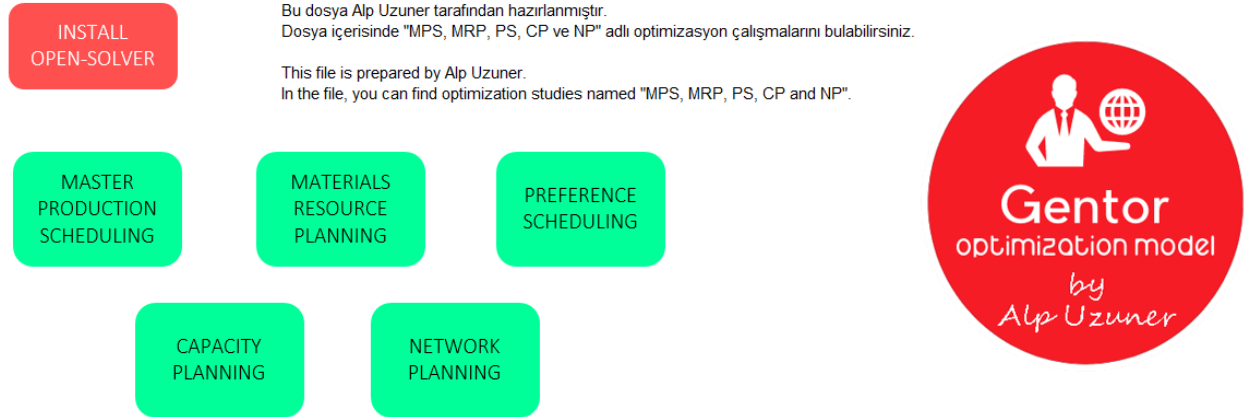**05.2018**

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Introduction

Gentor is a free Excel-VBA model that optimizes "Supply Chain" processes by using Open Solver add-in.

When you open the file "Gentor", you will see 1 button for installation and 5 buttons for optimization studies.

In order to use following 5 optimization studies effectively, you need to install Excel Add-in called "Open Solver".

Optimization Studies

1. MPS (Master Production Scheduling)
2. MRP (Materials Resource/Requirements Planning)
3. PS (Preference Scheduling)
4. CP (Capacity Planning)
5. NP (Network Planning)
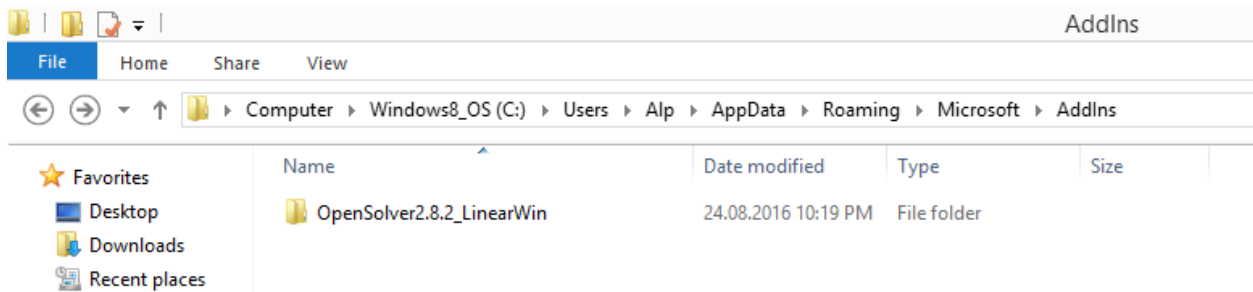
0. Installation – Open Solver

If you click on "Install Open-Solver" button in the file, you will be redirected to the web-page where you can download Excel Add-in:

INSTALL
OPEN-SOLVER
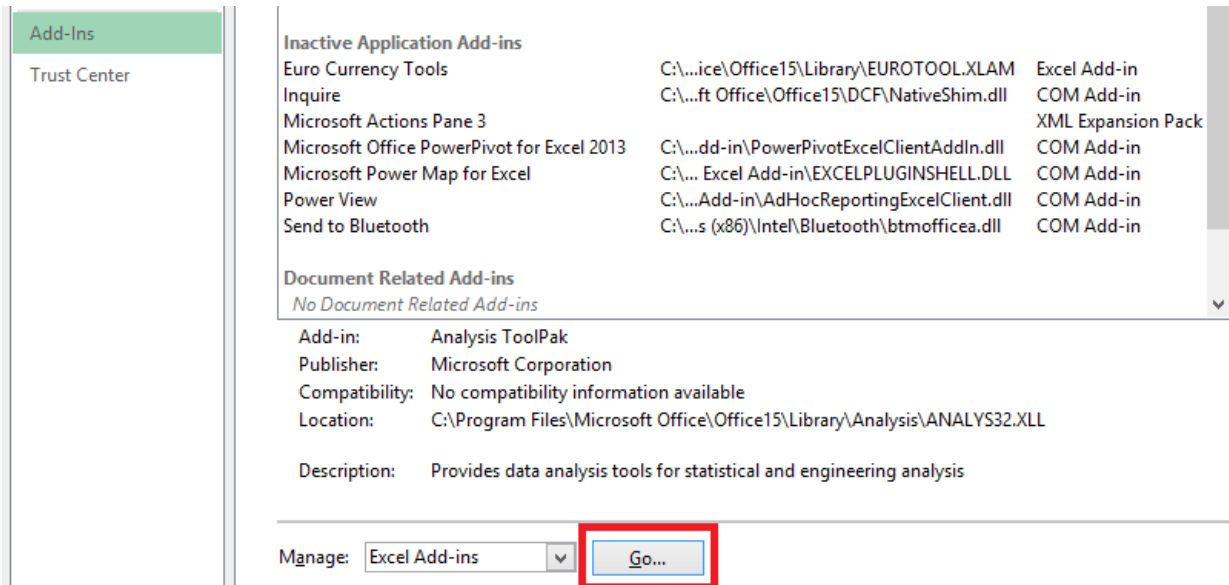
After download process is completed, extract the files from zip and copy them to the location below:

C:\Users\"user name"\AppData\Roaming\Microsoft\Addins

Then, you need to open "Gentor" Excel file and complete the installation. Here's what you need to do:

1. Click on File -> Options.
2. Go to the "Add-Ins" tab in the new window; then click on "Go..." button next to Manage (Excel-Add-ins).

3. New window will appear, click on "Browse" button.
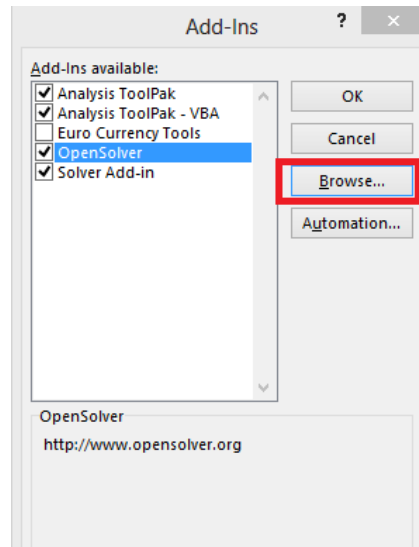
4. Go to the location where you copied "Open-Solver" files and select "OpenSolver.xlam" from there.

5. When you complete the installation successfully, you can see "OpenSolver" Add-in under "Data" tab in "Gentor" Excel file.

1. MPS (Master Production Scheduling)

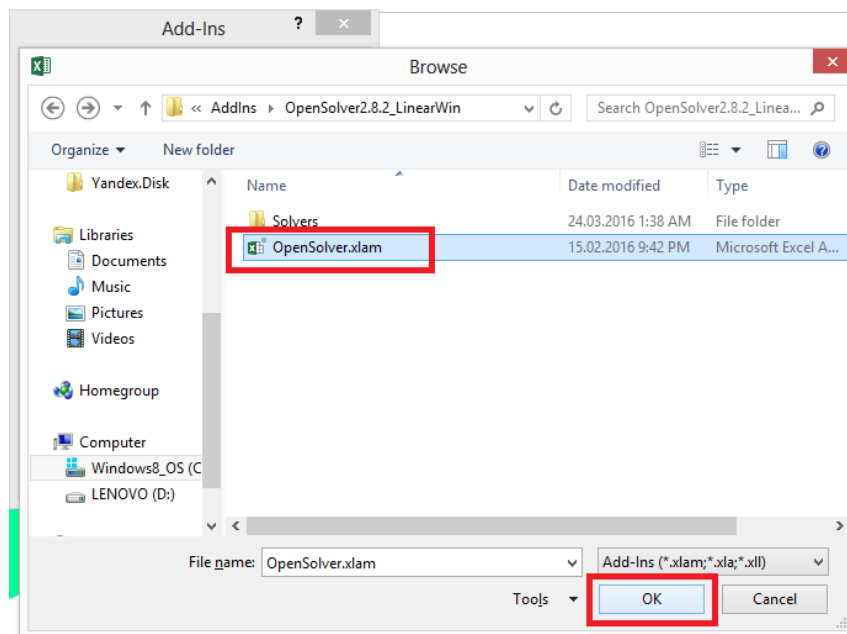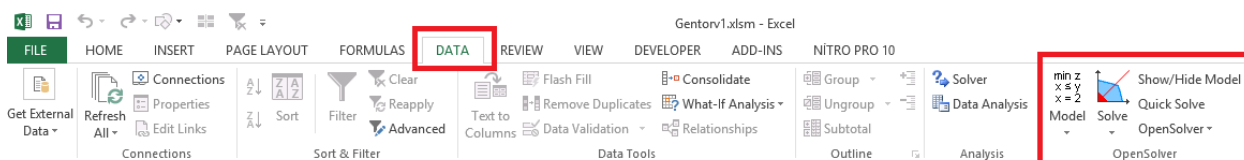The name of the first optimization tool is MPS (Master Production Scheduling). As everyone knows, while having excess inventory is generally regarded as bad for companies, inventory shortage results in customer dissatisfaction. The balance between these two is difficult to manage and this can be done only by proper planning. Then, you can do proper planning with Gentor easily.

When you open "Gentor" file, click on "Master Production Scheduling" button.
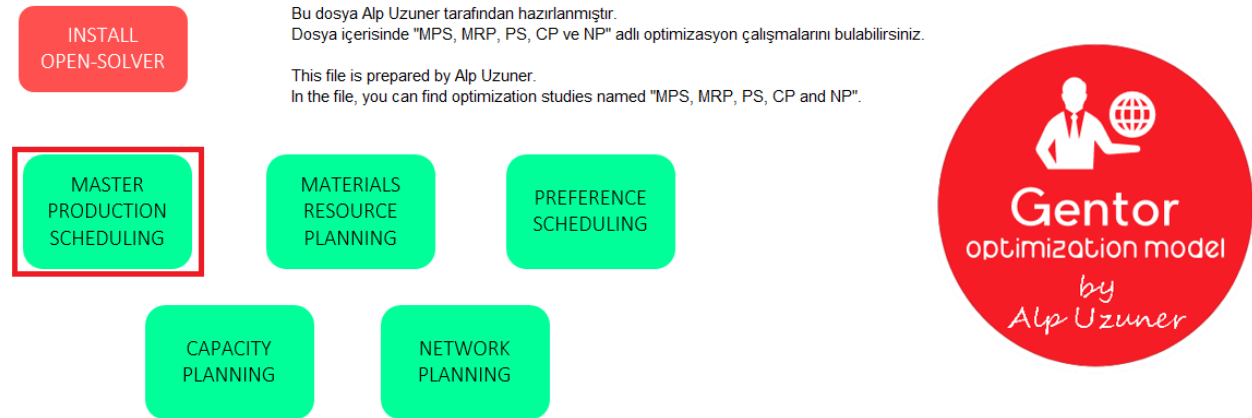
When you click on button, a new screen will appear. On this screen, Gentor will ask you whether you want to install "Model" or not. If you have already completed the installation before, you need to click on "NO" in order not to reset your work. If this is the first time you build a model, you need to click on "YES" to perform the installation process. We will click on "YES" since we will build "Master Production Scheduling" model for the first time.
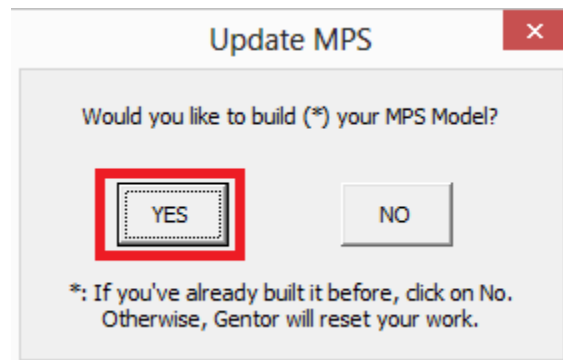
On the next screen, you will then be asked to decide how many finished goods you want to optimize.

PS: Maximum finished goods you can define is 50.

New page will be designed based on the number of finished goods you have entered. On this screen, there are 8 fields you need to enter:

- ***Finished Goods Number:*** Finished goods' number,
- ***Finished Goods Text:*** Finished goods' text,
- ***Batch Size:*** The batch size of finished goods (The amount you can produce in one production),
- ***Starting Stock:*** Starting stock of finished goods,
- ***Responsible:*** Responsible person,
- ***Cost:*** Cost of one finished good,
- ***Min:*** Minimum number of parties that can be produced when production is made. (For Example: If you enter 2 here, even 1 party meets your needs, Gentor will propose you at least 2 parties for production.
- ***Max:*** Maximum number of parties that can be produced when production is made. (You cannot produce more than this amount. Gentor revises its production planning proposal by considering the previous and next months to meet this rule)

When you click on "OK" button, you will complete the installation process and 10 new sheets, which can be seen below, will be activated.

"Configuration" sheet will appear first and you will see finished goods that you just defined in the user form.

FG No	FG Text	Batch Size	Starting Stock	Responsible	Cost	Min	Max
900001	Painkiller 1	58,000	150,000	Alp Uzuner	1.35 €	2	7
900002	Antifebrile 1	36,000	64,000	Alp Uzuner	2.50 €	2	7
900003	Cough Medicine 1	30,000	185,000	Alp Uzuner	2.00 €	3	15

Later on, you can define the forecasts for your finished goods on a monthly basis.

PS: You can enter forecasts for 48 months at most.

FG No	FG Text	Nisan 18	Mayıs 18	Haziran 1	Temmuz	Ağustos 1	Eylül 18	Ekim 18	Kasım 1	Aralık 1	Ocak 19	Şubat 1
900001	Painkiller 1	60,000	50,000	45,000	25,000	35,000	20,000	18,000	42,000	40,000	40,000	45,000
900002	Antifebrile 1	10,544	16,298	35,000	11,000	4,751	5,000	8,000	12,000	22,000	16,000	16,000
900003	Cough Medicine 1	91,282	130,000	97,000	87,000	80,424	116,000	117,000	90,894	90,000	79,936	86,000

You can the define "Days of Coverage" for your finished goods on a monthly basis in "DoC" sheet. The calculation will be made based on the amounts you entered in the "Forecast" sheet. In brief, you can use this sheet to determine days of stock on hand at the end of month.

FG No	FG Text	Nisan 18	Mayıs 18	Haziran 18	Temmuz 18	Ağustos 18	Eylül 18	Ekim 18	Kasım 18	Aralık 18	Ocak 19	Şubat 19	Mart 19
900001	Painkiller 1	60	60	60	60	60	60	60	60	60	60	60	60
900002	Antifebrile 1	45	45	45	45	45	45	45	45	45	45	45	45
900003	Cough Medicine 1	50	50	50	50	50	50	50	50	50	50	50	50

You can define safety stock for a specific month via "Extra" sheet. Let's say: You define 60 days stock on hand at the end of July for finished good "Painkiller 1". However, you receive new information and need extra 15.000 stock. If you enter 15.000 for July in "Extra" sheet, you will have at least 60 days stock on hand plus 15.000 extra stock at the end of July.

FG No	FG Text	Nisan 18	Mayıs 18	Haziran 18	Temmuz 18	Ağustos 18	Eylül 18	Ekim 18	Kasım 18	Aralık 18	Ocak 19	Şubat 19	Mart 19
900001	Painkiller 1				15,000								
900002	Antifebrile 1												
900003	Cough Medicine 1												

In "Min Prod. (Month)" sheet, you can define minimum number of production for a specific month. Even if you do not need a production, you can force Gentor to give production proposal thanks to this sheet.

The difference between this sheet and "Min section in Configuration sheet" that Configuration sheet considers generally while this sheet can be processed monthly.

Let's assume that we will produce 3 validation parties for "Antifebrile 1" in August. Then, you can enter 3 for "Antifebrile 1" in August.

FG No	FG Text	Nisan 18	Mayıs 18	Haziran 18	Temmuz 18	Ağustos 18	Eylül 18	Ekim 18	Kasım 18	Aralık 18	Ocak 19	Şubat 19	Mart 19
900001	Painkiller 1												
900002	Antifebrile 1					3							
900003	Cough Medicine 1												

In "Max Prod. (Month)" sheet, you can define maximum number of production for a specific month. This sheet can be used when there are not enough "Raw & Packaging Materials" for production and if your production facility is closed for maintenance. Gentor will prepare your production plan by changing the previous and next months to meet constraints.

Let's assume that our production facility is closed for machine maintenance in November so that we cannot make production and we can produce 3 parties for "Cough Medicine 1" at most in September due to the fact we do not have raw materials.

FG No	FG Text	Nisan 18	Mayıs 18	Haziran 18	Temmuz 18	Ağustos 18	Eylül 18	Ekim 18	Kasım 18	Aralık 18	Ocak 19	Şubat 19
900001	Painkiller 1								0			
900002	Antifebrile 1								0			
900003	Cough Medicine 1						3		0			

We can directly remove stock from "(-) Stock" sheet. We defined 3 validation parties for "Antifebrile 1" in August. Since it is a validation production, we cannot sell them in same month. Therefore, it should not be on the sales stock. If I write 108.000 (3 x 36.000 (Antifebrile 1 batch size)) in August, it won't appear on the stock even if it is produced.

FG No	FG Text	Nisan 18	Mayıs 18	Haziran 18	Temmuz 18	Ağustos 18	Eylül 18	Ekim 18	Kasım 18	Aralık 18	Ocak 19	Şubat 19
900001	Painkiller 1											
900002	Antifebrile 1					108,000						
900003	Cough Medicine 1											

We can directly enter stock from "(+) Stock" sheet. If we say that "Antifebrile 1" can be sold 3 months after validation productions, we can then write 108.000 in November 18.

FG No	FG Text	Nisan 18	Mayıs 18	Haziran 18	Temmuz 18	Ağustos 18	Eylül 18	Ekim 18	Kasım 18	Aralık 18	Ocak 19	Şubat 19
900001	Painkiller 1											
900002	Antifebrile 1								108,000			
900003	Cough Medicine 1											

In "Your Plan" sheet, you can enter your current plan. Once you run Gentor, you can compare Gentor's results with yours.

FG No	FG Text	Nisan 18	Mayıs 18	Haziran 18	Temmuz 18	Ağustos 18	Eylül 18	Ekim 18	Kasım 18	Aralık 18	Ocak 19	Şubat 19
900001	Painkiller 1	4	3	3	4	0	4	3	4	4	4	3
900002	Antifebrile 1	2	0	1	4	0	2	0	1	0	1	2
900003	Cough Medicine 1	15	3	6	9	7	8	11	8	9	8	9

Finally, we go back to "Model" sheet to run Gentor. You can specify the date range from cells B2 and C2, the product range from cells B4 and C4. Click on "Gentor" logo after you define everything.

Once you click on logo, Gentor will run for you. When it is completed, a new file called "Plan" will be created on the desktop. In this file, you can find Gentor's production proposal and comparison between Gentor's results and yours in detail.

When you open file "Plan", you will find sheets "Plan" and "Difference".

In "Plan" sheet, you can find Gentor's production plan proposal. Let's remember the constraints we define:

1. We wanted Gentor to run for 3 finished goods and set the date range from April 18 to February 19.
2. For "Painkiller 1", the minimum number of production was 2 while the maximum number was 7.
3. For "Antifebrile 1", the minimum number of production was 2 while the maximum number was 7.
4. For "Cough Medicine 1", the minimum number of production was 3 while the maximum number was 15.
5. We wanted minimum 3 production parties for "Antifebrile 1" in August
6. We wanted maximum 3 production parties for "Cough Medicine 1" in September.
7. Since our production facility is closed for machine maintenance in November, there would be no production in November.

As you can see from the table below, all constraints have been met.

FG No	FG Text	Nisan 18	Mayıs 18	Haziran 18	Temmuz 18	Ağustos 18	Eylül 18	Ekim 18	Kasım 18	Aralık 18	Ocak 19	Şubat 19
900001	Painkiller 1	2	0	0	0	0	2	0	0	2	0	2
900002	Antifebrile 1	0	2	0	0	3	0	0	0	0	0	0
900003	Cough Medicine 1	4	3	3	3	4	3	6	0	3	3	3

You can compare Gentor's results with your own plan in detail in "Difference" sheet.

	FG NO	FG TEXT		Nisan 18	Mayıs 18	Haziran 18	Temmuz 18	Ağustos 18	Eylül 18	Ekim 18	Kasım 18	Aralık 18	Ocak 19	Şubat 19
1	900001	Painkiller 1	Forecast	60,000	50,000	45,000	25,000	35,000	20,000	18,000	42,000	40,000	40,000	45,000
	BATCH SIZE		Days Of Coverage	60	60	60	60	60	60	60	60	60	60	60
	58,000		Your Production Plan	4	3	3	4	0	0	0	0	2	4	3
	MIN	MAX	Your Produced Amount	232,000	174,000	174,000	232,000	0	0	0	0	116,000	232,000	174,000
	2	7	Model Production Plan	2	0	0	0	0	2	0	0	2	0	2
	STARTING STOCK	COST	Model Produced Amount	116,000	0	0	0	0	116,000	0	0	116,000	0	116,000
	150,000	1.35 €	Your Starting Stock	150,000	322,000	446,000	575,000	782,000	747,000	727,000	709,000	667,000	743,000	935,000
	CURRENT COST	MODEL COST	Model Starting Stock	150,000	206,000	156,000	111,000	86,000	51,000	147,000	129,000	87,000	163,000	123,000
	10,417,950.00 €	1,961,550.00 €	Your Ending Stock	322,000	446,000	575,000	782,000	747,000	727,000	709,000	667,000	743,000	935,000	1,064,000
	Current Production	Model Production	Model Ending Stock	206,000	156,000	111,000	86,000	51,000	147,000	129,000	87,000	163,000	123,000	194,000
	23	8	Your DoC	275	358	>=360	>=360	>=360	>=360	>=360	>=360	>=360	>=360	>=360
	RESPONSIBLE		Model DoC	189	159	129	99	69	125	95	65	106	76	139
	Alp Uzuner		Your Cost	434,700.00 €	602,100.00 €	776,250.00 €	1,055,700.00 €	1,008,450.00 €	981,450.00 €	957,150.00 €	900,450.00 €	1,003,050.00 €	1,262,250.00 €	1,436,400.00 €
			Your Cumulative Cost	434,700.00 €	1,036,800.00 €	1,813,050.00 €	2,868,750.00 €	3,877,200.00 €	4,858,650.00 €	5,815,800.00 €	6,716,250.00 €	7,719,300.00 €	8,981,550.00 €	10,417,950.00 €
	MODEL STATUS	CURRENT STATUS	Model Cost	278,100.00 €	210,600.00 €	149,850.00 €	116,100.00 €	68,850.00 €	198,450.00 €	174,150.00 €	117,450.00 €	220,050.00 €	166,050.00 €	261,900.00 €
	CORRECT	CORRECT	Model Cumulative Cost	278,100.00 €	488,700.00 €	638,550.00 €	754,650.00 €	823,500.00 €	1,021,950.00 €	1,196,100.00 €	1,313,550.00 €	1,533,600.00 €	1,699,650.00 €	1,961,550.00 €

Lastly, we said that 3 validation parties for "Antifebrile 1" can be sold in November rather than August. As you can see, Gentor met this constraint in its production plan.

		FG NO	FG TEXT		Nisan 18	Mayıs 18	Haziran 18	Temmuz 18	Ağustos 18	Eylül 18	Ekim 18	Kasım 18	Aralık 18	Ocak 19	Şubat 19
2	900002	Antifebrile 1	Forecast	10,544	16,298	35,000	11,000	4,751	5,000	8,000	12,000	22,000	16,000	16,000
	BATCH SIZE		Days Of Coverage	45	45	45	45	45	45	45	45	45	45	45
	36,000		Your Production Plan	2	0	1	4	0	0	0	0	2	1	2
	MIN	MAX	Your Produced Amount	72,000	0	36,000	144,000	0	0	0	0	72,000	36,000	72,000
	2	7	Model Production Plan	0	2	0	0	3	0	0	0	0	0	0
	STARTING STOCK	COST	Model Produced Amount	0	72,000	0	0	108,000	0	0	0	0	0	0
	64,000	2.50 €	Your Starting Stock	64,000	125,456	109,158	110,158	243,158	130,407	125,407	117,407	213,407	263,407	283,407
	CURRENT COST	MODEL COST	Model Starting Stock	64,000	53,456	109,158	74,158	63,158	58,407	53,407	45,407	141,407	119,407	103,407
	5,151,943.07 €	2,271,943.07 €	Your Ending Stock	125,456	109,158	110,158	243,158	130,407	125,407	117,407	213,407	263,407	283,407	339,407
	Current Production	Model Production	Model Ending Stock	53,456	109,158	74,158	63,158	58,407	53,407	45,407	141,407	119,407	103,407	87,407
	12	5	Your DoC	261	231	258	>=360	288	258	228	>=360	>=360	>=360	>=360
	RESPONSIBLE		Model DoC	66	231	201	171	141	111	81	358	328	298	268
	Alp Uzuner		Your Cost	313,640.53 €	272,894.66 €	275,394.66 €	607,894.66 €	326,016.94 €	313,516.94 €	293,516.94 €	533,516.94 €	658,516.94 €	708,516.94 €	848,516.94 €
			Your Cumulative Cost	313,640.53 €	586,535.19 €	861,929.85 €	1,469,824.50 €	1,795,841.44 €	2,109,358.38 €	2,402,875.32 €	2,936,392.26 €	3,594,909.20 €	4,303,426.13 €	5,151,943.07 €
	MODEL STATUS	CURRENT STATUS	Model Cost	133,640.53 €	272,894.66 €	185,394.66 €	157,894.66 €	146,016.94 €	133,516.94 €	113,516.94 €	353,516.94 €	298,516.94 €	258,516.94 €	218,516.94 €
	CORRECT	CORRECT	Model Cumulative Cost	133,640.53 €	406,535.19 €	591,929.85 €	749,824.50 €	895,841.44 €	1,029,358.38 €	1,142,875.32 €	1,496,392.26 €	1,794,909.20 €	2,053,426.13 €	2,271,943.07 €

The next time you run Gentor, do not forget to click on "NO" button. Otherwise, Gentor will reset your work.
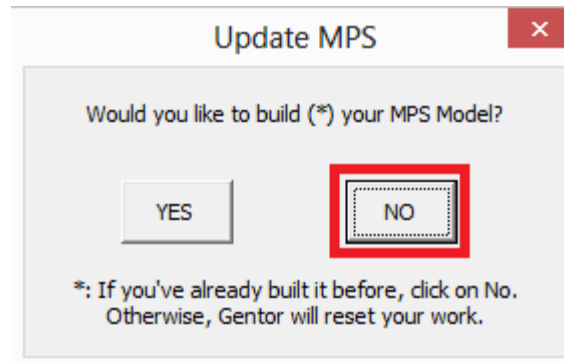
2. MRP (Materials Resource/Requirements Planning)

Excess inventory does not only cause cost, it also affects storage capacity adversely. If you want to place orders at the right time and at the right amount, you can use Gentor - MRP tool. Briefly, you can plan your packaging and raw materials consumed in your finished goods through this tool.

When you open Gentor, click on "Materials Resource Planning" button.
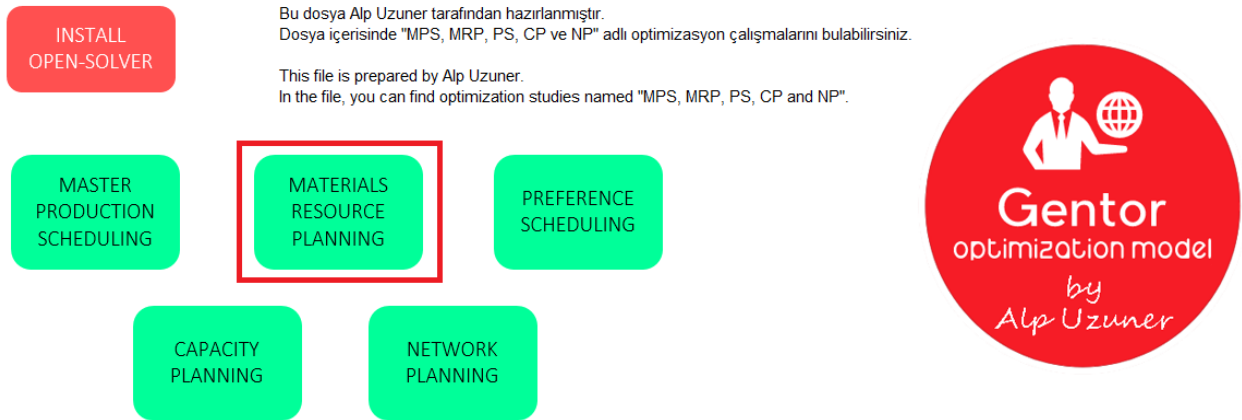
When you click on button, new screen will appear. On this screen, Gentor will ask you whether you want to install "Model" or not. If you have already completed the installation before, you need to click on "NO" in order not to reset your work. If this is the first time you build a model, you need to click on "YES" to perform the installation process. We will click on "YES" since we will build "Materials Resource Planning" model for the first time.
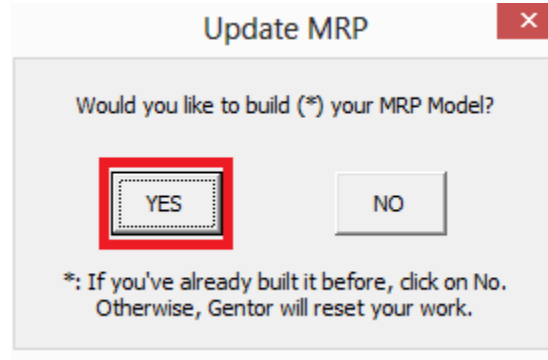
On the next screen, you will then be asked to decide how many materials you want to optimize.

PS: *Maximum materials you can define is 50.*

On the next screen, you can define the number of finished goods that your materials are consumed in.

PS: *Maximum finished goods you can define is 50.*

New page will be designed based on the number of materials you have entered. On this screen, there are 8 fields you need to enter:

- *Materials Number:* Materials' number,
- *Materials Text:* Materials' text,
- *Lead Time:* Lead time of materials (based on days),
- *MOQ:* Minimum order quantity for materials,
- *Pack Size:* Package size of the materials, also rounding value,
- *Offset:* You should be writing here: The number of months you would like to bring the material prior to the actual need. (For example: If you want to bring the material two months before the need, you should write here " -2 "),
- *Responsible:* Responsible of the material,
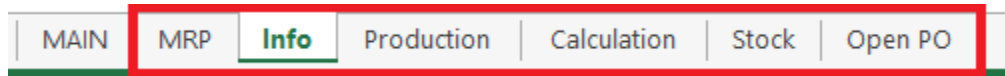- *Supplier:* Supplier of the material.

When you click on "OK" button, you will see new page which is designed based on the number of finished goods you have entered. Write the number and name of your finished goods here.

When you click on "OK" button in the new screen, you will complete the installation process and 6 new sheets, which can be seen below, will be activated.

"Info" sheet will appear first and you will see materials that you just defined in the user form.

Mat No	Mat Text	Lead Time	MOQ	Pack Size	Offset	Responsible	Supplier	Total Stock
700001	Packaging Material 1	30	10,000	1,000	-1	Alp Uzuner	Supp A	0
700002	Packaging Material 2	45	10,000	1,000	-1	Alp Uzuner	Supp B	0
800001	Raw Material 1	60	500	50	-2	Alp Uzuner	Supp C	0

Firstly, enter your production plan from "Production" sheet.

FG NO	FG Text	Nisan 18	Mayıs 18	Haziran 1	Temmuz 1	Ağustos 1	Eylül 18	Ekim 18	Kasım 18	Aralık 18	Ocak 19
900001	Painkiller 1	0	0	6	6	9	8	8	3	7	3
900002	Antifebrile 1	0	0	6	4	3	7	9	9	2	0
900003	Cough Medicine 1	0	0	10	2	9	10	0	7	10	0
900004	Fungicide 1	0	0	7	10	2	0	4	4	4	4
900005	Dental Medicine 1	0	0	9	1	7	6	2	8	3	10

Later, you need to create a mini BOM in "Calculation" sheet. For this, you should write how much of your materials are consumed for one party of your finished goods. What you need to do is quite simple:

1. Write the name of your material to Column C,
2. Write the name of your finished goods to Column F,
3. Write the amount of consumption to Column D.

Calculation will be done automatically.

PS: You should write the name of your materials and finished goods as you defined them to Gentor.

	B	C	D	E	F	G	H	I	J	K
	Mat N	Mat Text	Consumption	FG NO	FG Text	Nisan 18	Mayıs 18	Haziran 1	Temmuz 1	Ağustos 1
3	700001	Packaging Material 1	15,000	900001	Painkiller 1	0	0	90,000	90,000	135,000
4	700002	Packaging Material 2	25,000	900002	Antifebrile 1	0	0	150,000	100,000	75,000
5	800001	Raw Material 1	20	900003	Cough Medicine 1	0	0	200	40	180
6	800001	Raw Material 1	35	900004	Fungicide 1	0	0	245	350	70
7	800001	Raw Material 1	25	900005	Dental Medicine 1	0	0	225	25	175

You can define current stock on material basis from "Stock" sheet.

PS: When you click on "Delete" button, the stocks you have defined will be automatically deleted.

Delete

Material	Material Description	Stock
700001	Packaging Material 1	208,400.00
700002	Packaging Material 2	103,224.00
800001	Raw Material 1	500.00

You can define open purchase orders from "Open PO" sheet. The dates and quantities you have written, will be processed automatically in "MRP" sheet.

PS: When you click on "Delete" button, all open purchase orders you have defined will be automatically deleted.

PS 2: Purchasing document is the number of purchase orders, not affecting the calculation.

Delete

Purchasing Document	Material	Short Text	Delivery Date	Order Quantity
100001	700001	Packaging Material 1	30.04.2018	15,000.00
100002	700002	Packaging Material 2	01.05.2018	25,000.00
100003	800001	Raw Material 1	07.06.2018	300.00

Lastly, we are going to "MRP" sheet to run Gentor. You can set the date range from cells B8 and C8.

The amounts you have written in "Open PO" sheet will also appear on the "Open PO" line in "MRP" sheet.

You can also see stock and consumption amount based on the production plan you defined:

Click on "Gentor" logo after you define everything.

Once you click on logo, Gentor will run for you. When it is completed, a new file called "New Order" will be created on the desktop. In this file, you can find Gentor's order proposal.

When you open file "New Order", you will find order proposal from Gentor.

Mat No	Mat Text	Delivery Date	Quantity	Responsible	Supplier
700002	Packaging Material 2	Mayıs 18	22,000	Alp Uzuner	Supp B
700002	Packaging Material 2	Haziran 18	100,000	Alp Uzuner	Supp B
800001	Raw Material 1	Mayıs 18	750	Alp Uzuner	Supp C

You need to immediately place order proposals you see in the file "New Order". You can check proposals for other months on "Order" line in MRP sheet of Gentor file.

| Mat No	Mat Text	Stock		12 Nisan 18	13 Mayıs 18	14 Haziran 18	15 Temmuz 18	16 Ağustos 18	17 Eylül 18	18 Ekim 18	19 Kasım 18
			SS	208,400	223,400	223,400	133,400	43,400	400	400	400
			Consumption	0	0	90,000	90,000	135,000	120,000	120,000	45,000
			Dec. Var. 1	0	0	0	1	1	1	1	1
			Dec. Var. 2	0	0	0	82	110	110	35	95
700001	Packaging Material 1	208,400	M	0	0	0	10,000	10,000	10,000	10,000	10,000
			Order	0	0	0	92,000	120,000	120,000	45,000	105,000
			Open PO	15,000	0	0	0	0	0	0	0
			ES	223,400	223,400	133,400	43,400	400	400	400	400
			Cumulative	223,400	446,800	580,200	623,600	624,000	624,400	624,800	625,200

The next time you run Gentor, do not forget to click on "NO" button. Otherwise, Gentor will reset your work.
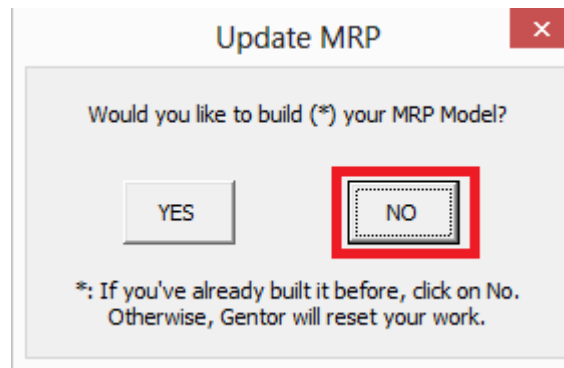
3. PS (Preference Scheduling)

It is really difficult to make everyone happy and be fair in business life especially in shift planning & scheduling. You can use Gentor - PS tool to get through this problem.

When you open "Gentor" file, click on "Preference Scheduling" button.
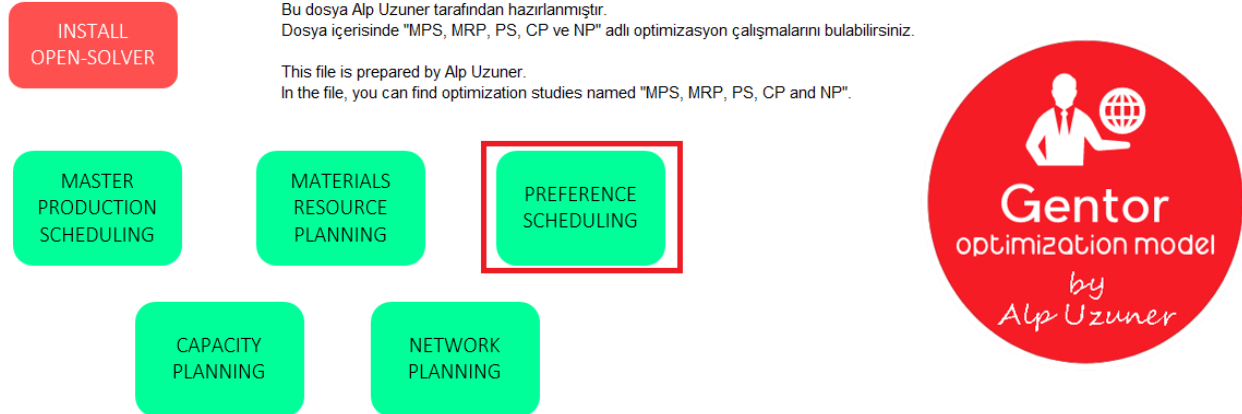
When you click on button, a new screen will appear. On this screen, Gentor will ask you whether you want to install "Model" or not. If you have already completed the installation before, you need to click on "NO" in order not to reset your work. If this is the first time you build a model, you need to click on "YES" to perform the installation process. We will click on "YES" since we will build "Preference Scheduling" model for the first time.

Before I move on to the next step, I want to talk about a few features and the rules of this tool:

- During the installation step, you can choose 5 different levels: Level 1, Level 2, Level 3, Level 4 and Level 5. Privilege rank as follows: Level 5 > Level 4 > Level 3 > Level 2 > Level 1 so that the preferences of Level 5s will be taken into consideration more than the others.
- You can define the minimum number of people needed to work for morning and evening shift.
- You can also define the minimum number of people needed to work for each level.
- You can define the days for vacation.

Rules

1. People take x days off during the week. (x will be defined by you)
2. People cannot work more than 1 shift in a day.
3. People cannot work more than 3 night shifts during the week.
4. 3 consecutive night shifts is avoided.
5. Model prevents people from being assigned in following shifts.
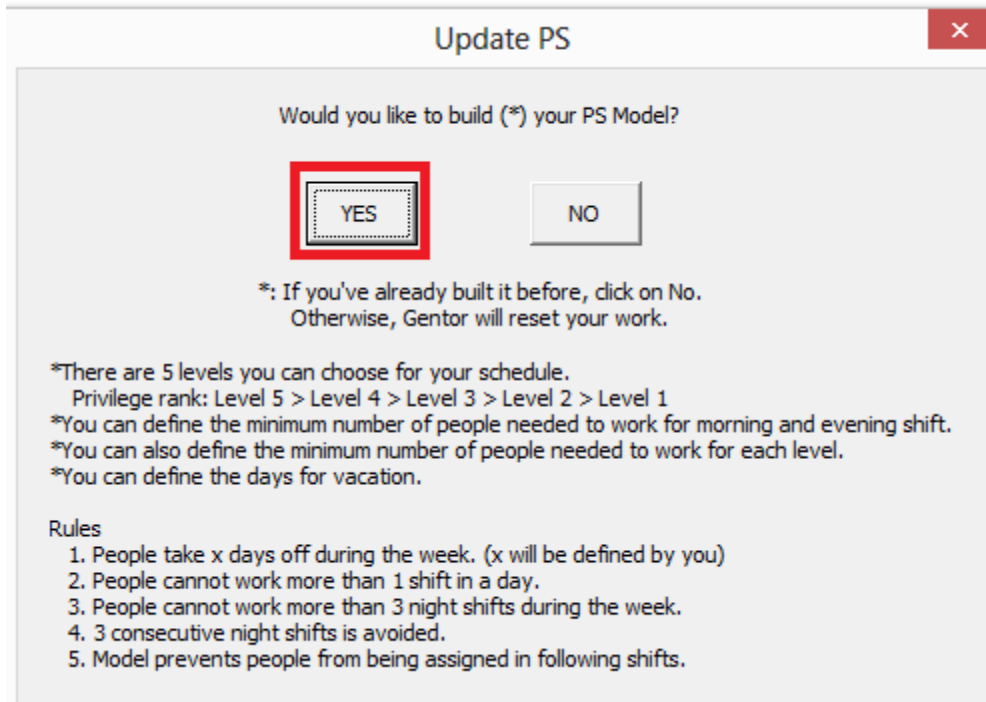
On the new screen, you will be asked how many people you want to optimize.

PS: *Maximum people you can define is 50.*
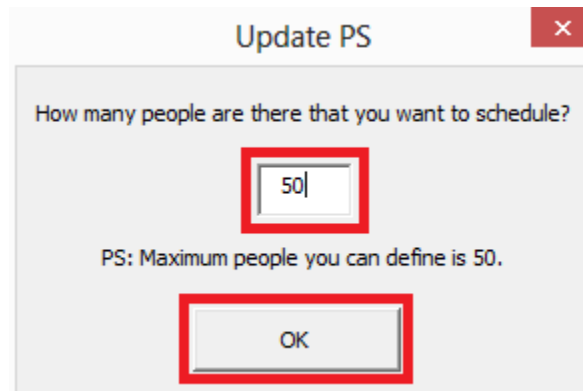
New page will be designed based on the number of people you have entered. On this screen, there are 2 fields you need to enter:

- **People Name:** People's name,
- **Level:** People's level.

On the next screen, you can define the number of days off in a week.

PS: *The maximum number of days off you can define is 4.*

On the new screen, while you can set the minimum number of workers for morning and evening shifts, you can also set the minimum number of workers for each level.

Update PS

Minimum People		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
In Total	Morning	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	Evening	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Level 1	Morning	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Evening	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Level 2	Morning	2	2	2	2	2	2	2	2	3	2	2	2	2	3
	Evening	2	2	2	2	2	2	2	2	3	2	2	2	2	3
Level 3	Morning	2	2	2	2	2	2	2	2	3	2	2	2	2	3
	Evening	2	2	2	2	2	2	2	2	3	2	2	2	2	3
Level 4	Morning	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Evening	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Level 5	Morning	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Evening	0	0	0	0	0	0	0	0	0	0	0	0	0	0

OK

When you click on "OK" button, you will be redirected to "Day Off Preferences" sheet. You can enter day off preferences based on days according to the number you set. We set the number of day off as 2.

PS: You can write "1" for the day that you want it as day off.

Day Off Preferences

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	SUM	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14	SUM
Person 1			1		1			2	1			1				2
Person 2				1		1		2					1		1	2
Person 3	1					1		2		1		1				2
Person 4				1		1		2	1				1			2
Person 5					1		1	2				1		1		2
Person 6	1						1	2		1					1	2
Person 7			1				1	2					1	1		2
Person 8		1				1		2			1	1				2
Person 9			1	1				2						1	1	2

Click on "Gentor" logo after you define everything.

Once you click on logo, Gentor will run for you. When it is completed, you will be redirected to a new sheet called "Table". In this sheet, you can find Gentor's results and proposal for working days of each workers.

		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14	Average
	Morning	23	20	20	22	20	20	20	20	20	21	22	20	20	20	91%
	Evening	15	15	15	15	15	15	15	15	16	16	15	15	15	15	
8 Level 1	Morning	2	2	3	2	2	4	4	4	2	2	2	3	3	3	69%
	Evening	3	3	3	3	3	3	3	3	3	3	3	3	3	3	
10 Level 2	Morning	5	5	3	2	2	6	6	7	4	3	4	2	2	3	80%
	Evening	2	2	6	4	2	3	2	2	4	3	3	6	4	3	
14 Level 3	Morning	6	4	5	7	7	4	4	5	6	8	8	6	8	4	100%
	Evening	6	7	4	3	3	5	5	5	3	3	3	3	3	5	
10 Level 4	Morning	5	3	6	6	4	3	4	2	6	4	5	5	4	6	100%
	Evening	3	2	1	4	4	2	3	2	3	4	3	2	2	2	
8 Level 5	Morning	5	6	3	5	5	3	2	2	2	4	3	4	3	4	100%
	Evening	1	1	1	1	3	2	2	3	3	3	3	1	3	2	

Working Day		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14	Pref
Level 3	Person 1 Morning	1	0	0	0	0	1	0	0	1	0	0	1	0	0	100%
	Person 1 Evening	0	1	0	1	0	0	1	0	0	1	0	0	1	1	
Level 2	Person 2 Morning	1	0	0	0	1	0	0	0	0	0	0	0	1	1	50%
	Person 2 Evening	0	0	1	0	0	1	1	1	0	1	1	0	0	0	
Level 4	Person 3 Morning	0	1	1	0	0	0	0	0	0	1	0	1	1	1	100%
	Person 3 Evening	0	0	0	1	1	0	1	1	0	0	0	0	0	0	

As you can see from the first table above, preference results are 91% for overall, 69% for Level 1, 80% for Level 2, 100% for Level 3, 100% for Level 4, 100% for Level 5. Preferences results are lower for Level 1 and Level 2 as their levels are lower than others. Gentor gives privilege to Level 3, Level 4 and Level 5 since their levels are higher.
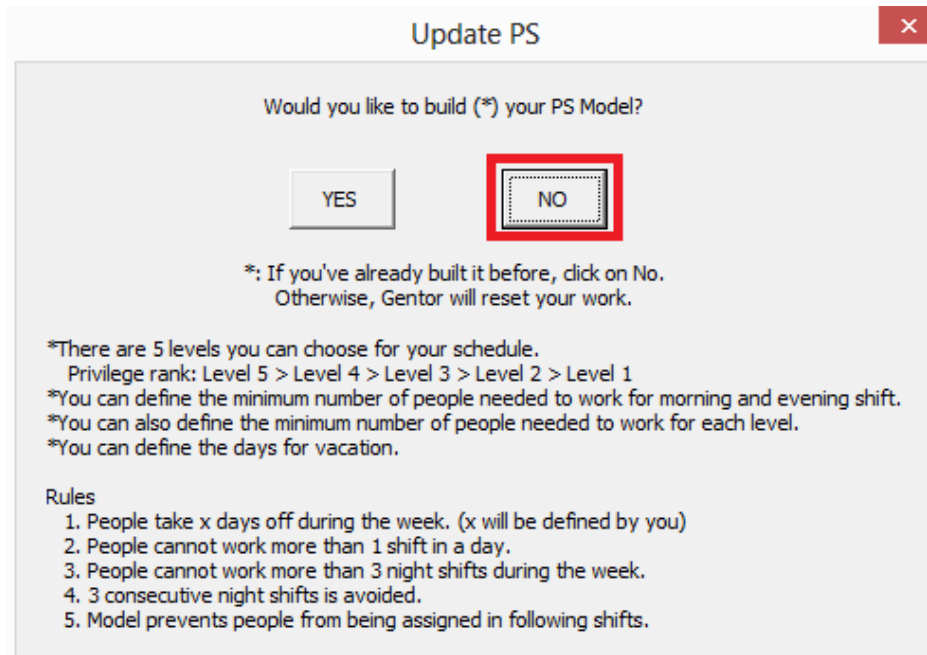
On the second table, you can find Gentor proposals of which days and shifts workers should work in. Example: Person 1:

Morning shifts: *Day 1, Day 6, Day 9, Day 12.*

Evening shifts: *Day 2, Day 4, Day 7, Day 10, Day 13, Day 14*

Day off: *Day 3, Day 5, Day 8, Day 11.*

The next time you run Gentor, do not forget to click on "NO" button. Otherwise, Gentor will reset your work.

Update PS

Would you like to build (*) your PS Model?

YES   NO

*: If you've already built it before, click on No.
Otherwise, Gentor will reset your work.

*There are 5 levels you can choose for your schedule.
  Privilege rank: Level 5 > Level 4 > Level 3 > Level 2 > Level 1
*You can define the minimum number of people needed to work for morning and evening shift.
*You can also define the minimum number of people needed to work for each level.
*You can define the days for vacation.

Rules
  1. People take x days off during the week. (x will be defined by you)
  2. People cannot work more than 1 shift in a day.
  3. People cannot work more than 3 night shifts during the week.
  4. 3 consecutive night shifts is avoided.
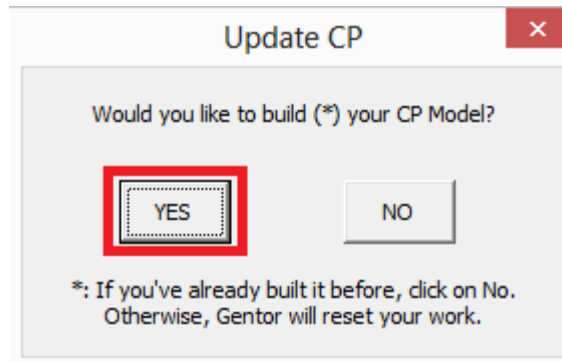 5. Model prevents people from being assigned in following shifts.

4. CP (Capacity Planning)

The name of the fourth optimization tool is "Capacity Planning". Many companies have different production facilities, these production facilities have different capacities, different products produced and there are many warehouses where these products are delivered. Deciding which products are produced at which production facilities according to need of warehouses is one of the most difficult decisions for Supply Chain processes. With regards to "Capacity Planning", you can easily achieve optimal results for a period of 12 months thanks to Gentor.

When you open "Gentor" file, click on "Capacity Planning" button.
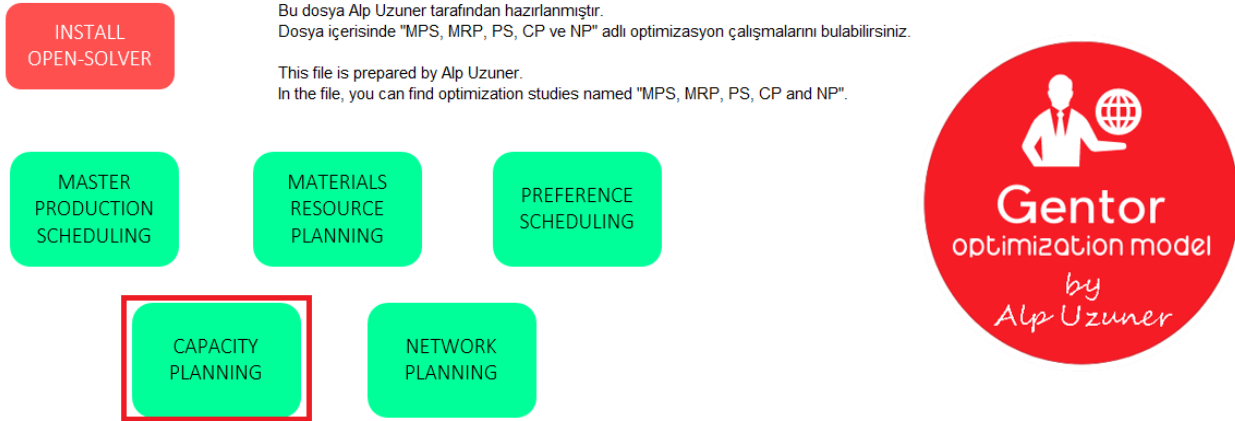
When you click on button, a new screen will appear. On this screen, Gentor will ask you whether you want to install "Model" or not. If you have already completed the installation before, you need to click on "NO" in order not to reset your work. If this is the first time you build a model, you need to click on "YES" to perform the installation process. We will click on "YES" since we will build "Capacity Planning" model for the first time.

On the new screen, you will be asked how many production facilities you have.

PS: *Maximum production facilities you can define is 3.*

Then, you will be asked to write their name.

On the next screen, you will be asked how many warehouses you have.

PS: *Maximum warehouses you can define is 10.*

Then, you will be asked to write their name.

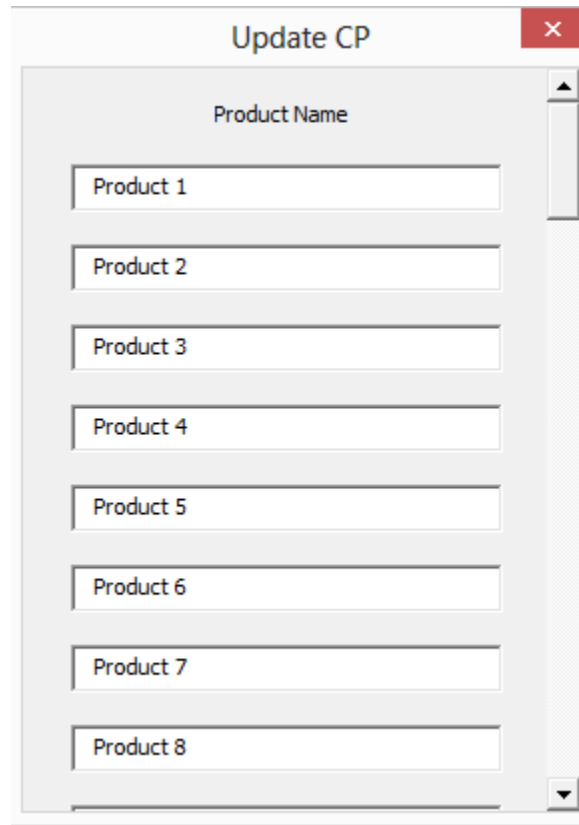On the next screen, you will be asked how many products you produce.

PS: Maximum products you can define is 50.

Then, you will be asked to write their name.

Later, you will be redirected to new sheet. In this new sheet, there are 4 fields you need to enter:

- *Capacity:* Capacity of production facility (based on minutes),
- *Binary:* Is your product produced in a relevant production facility? If it is produced, you need to write: 1, if it is not produced, you need to write: 0 (For example: While Product 5 can be produced at all production facilities, Product 6 can be only produced at production facility C),
- *Time:* The duration of production of the relevant product in a relevant production facility (based on minutes)
- *Cost:* The cost of producing one product in a relevant production facility.

Plant	Capacity
A	550,000
B	550,000
C	2,300,000

GO SECOND PHASE

Binary	Product 1	Product 2	Product 3	Product 4	Product 5	Product 6	Product 7	Product 8	Product 9	Product 10
A	1	1	1	1	1	0	0	0	1	1
B	0	0	1	0	1	0	1	1	0	1
C	1	1	1	1	1	1	1	1	1	1

Time	Product 1	Product 2	Product 3	Product 4	Product 5	Product 6	Product 7	Product 8	Product 9	Product 10
A	1.00	9.00	1.00	2.00	1.00	0.00	0.00	0.00	5.00	6.00
B	0.00	0.00	4.00	0.00	9.00	0.00	7.00	1.00	0.00	9.00
C	5.00	12.00	9.00	4.00	15.00	6.00	10.00	3.00	10.00	12.00

Cost	Product 1	Product 2	Product 3	Product 4	Product 5	Product 6	Product 7	Product 8	Product 9	Product 10
A	447	252	433	260	154	0	0	0	281	423
B	0	0	270	0	395	0	193	195	0	369
C	300	200	250	200	125	399	150	150	250	350

Once you have defined the fields, click on "GO SECOND PHASE" button above.

Plant	Capacity
A	550,000
B	550,000
C	2,300,000

GO SECOND PHASE

When you click on this button, you will be redirected to a new sheet where you can enter 12 months need of your warehouses on a product basis.

Demands of Warehouses for Each Product

Product 1	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Warehouse 1	1,051	1,697	136	1,210	688	1,106	1,230	1,655	303	173	1,712	1,396
Warehouse 2	263	310	822	1,346	361	952	1,624	546	75	659	1,374	1,468
Warehouse 3	575	694	398	296	572	1,588	1,607	135	412	428	1,904	1,443
Warehouse 4	1,173	388	159	188	1,638	1,095	226	1,553	391	1,967	1,504	1,313
Warehouse 5	842	1,670	679	638	1,269	414	1,954	164	599	1,008	959	1,186
Warehouse 6	123	1,691	506	1,334	788	455	1,099	920	1,722	727	472	404
Warehouse 7	1,994	1,690	507	585	674	840	354	1,485	770	468	530	630
Warehouse 8	81	240	1,437	583	434	301	1,161	1,784	205	1,608	528	1,774
Warehouse 9	572	680	450	1,315	725	1,484	1,949	1,292	578	1,197	1,860	323
Warehouse 10	1,315	1,018	1,860	211	340	1,216	1,463	268	1,261	1,320	1,638	1,170

Click on "Gentor" logo after you define everything.

Once you click on logo, Gentor will run for you. When it is completed, you will be redirected to a new sheet called "CP - Result". In this new sheet, you can find Capacity Utilization's results and also find proposal for which products are produced at which production facilities.

Production capacities of production facilities A and B were 550.000 while production capacity of production facility C was 2.300.000. As it can been from the table below, Gentor gives proposal to run 3 production facilities at full capacity.

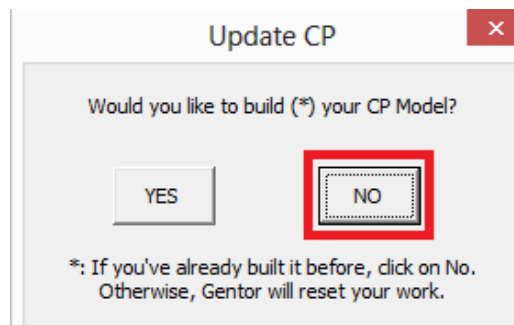|	Capacity Utilization		
	550,000	550,000	2,300,000
	A	B	C
Month 1	550,000	549,999	2,299,997
Month 2	543,067	549,997	2,299,999
Month 3	549,997	550,000	2,299,997
Month 4	549,984	550,000	2,299,995
Month 5	550,000	550,000	2,300,000
Month 6	550,000	549,994	2,300,000
Month 7	549,999	550,000	2,299,999
Month 8	549,999	550,000	2,300,000
Month 9	549,997	549,999	2,299,999
Month 10	550,000	549,999	2,300,000
Month 11	550,000	549,999	2,299,993
Month 12	550,000	550,000	2,300,000

In the next table, you will see the information about which products should be produced at which production facilities.

According to Gentor's proposal: While Product 1 should be produced at production facility C for 3 months, Product 2 should be produced at production facility A for the first 2 months and in month 3, 10.976 units of Product 2 should be produced at production facility C and the remaining 812 units should be produced at production facility A.

Briefly, you can find information about which products should be produced and where to be produced for a period of 12 months.

|	Month 1					Month 2					Month 3				
	Demand	Produced	A	B	C	Demand	Produced	A	B	C	Demand	Produced	A	B	C
Product 1	7,989	7,989	0	0	7,989	10,078	10,078	0	0	10,078	6,954	6,954	0	0	6,954
Product 2	11,916	11,916	11,906	0	10	10,302	10,302	10,302	0	0	11,788	11,788	812	0	10,976

The next time you run Gentor, do not forget to click on "NO" button. Otherwise, Gentor will reset your work.

Update CP

Would you like to build (*) your CP Model?

YES   NO

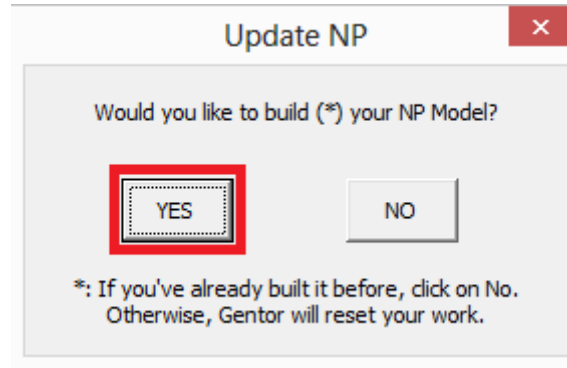*: If you've already built it before, click on No. Otherwise, Gentor will reset your work.

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5. NP (Network Planning)

The name of the last optimization tool is "Network Planning". Companies can reduce their logistics costs very easily thanks to the smart choices they make. Every company delivers their products to warehouses located at a certain distance from their production facilities in order to sell their products. It is actually not that difficult to find the right path for their deliveries. Through Gentor Optimization Model, you can easily find the optimal path.

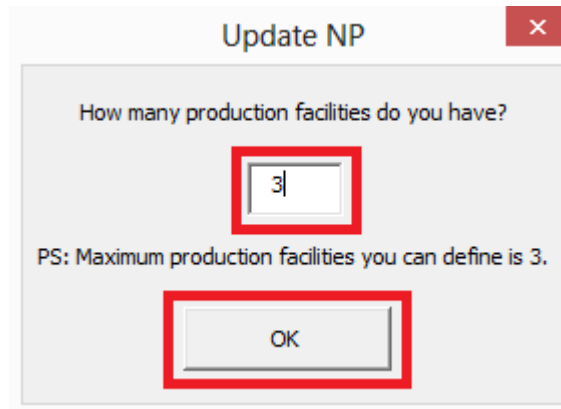When you open "Gentor" file, click on "Network Planning" button.
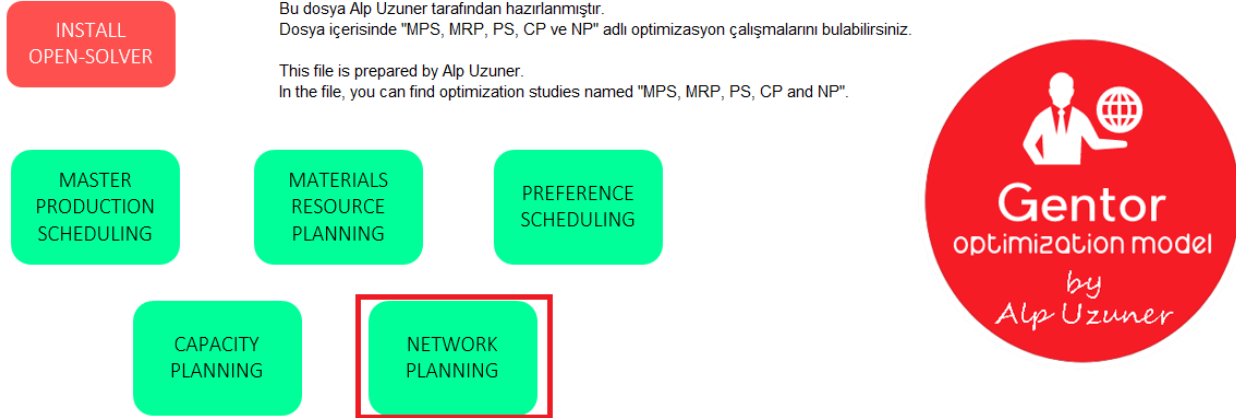
When you click on button, a new screen will appear. On this screen, Gentor will ask you whether you want to install "Model" or not. If you have already completed the installation before, you need to click on "NO" in order not to reset your work. If this is the first time you build a model, you need to click on "YES" to perform the installation process. We will click on "YES" since we will build "Network Planning" model for the first time.

On the new screen, you will be asked how many production facilities you have.

PS: Maximum production facilities you can define is 3.

Then, you will be asked to write their name.

On the next screen, you will be asked how many delivery points you have.

PS: Maximum delivery points you can define is 50.

Then, you will be asked to write their name.

Later, you will be redirected to new sheet. In this new sheet, there are 4 fields you need to enter:

- **Truck Price:** The cost of one truck that departs from your production facilities,
- **Fuel Price:** Fuel cost per km,
- **Binary:** Can you deliver from facility to facility? If the answer is yes, you need to write 1, if the answer is no, you need to write 0. (You should consider the rows as departure point and the column as arrival point. For example: You can deliver the goods from production facility A to DP 1 but you cannot deliver the goods from DP 1 to production facility A)

Truck Price										
A	2,450.00		Fuel Price	50.00				GO SECOND PHASE		
B	2,475.00									
C	2,750.00									

Example: If A goes to DP1, cell F10 value is 1.

Binary	A	B	C	DP 1	DP 2	DP 3	DP 4	DP 5	DP 6	DP 7
A	0	0	0	1	1	1	1	1	1	1
B	0	0	0	1	1	1	1	1	1	1
C	0	0	0	1	1	1	1	1	1	1
DP 1	0	0	0	0	1	1	1	1	1	1
DP 2	0	0	0	1	0	1	1	1	1	1
DP 3	0	0	0	1	1	0	1	1	1	1
DP 4	0	0	0	1	1	1	0	1	1	1
DP 5	0	0	0	1	1	1	1	0	1	1

Once you have defined the fields, click on "GO SECOND PHASE" button above.

Truck Price	
A	2,450.00
B	2,475.00
C	2,750.00

Fuel Price	50.00

GO
SECOND
PHASE

When you click on this button, you will be redirected to a new sheet where you can enter distance between locations based on KM. (You should consider the rows as departure point and the columns as arrival point. For example: Distance between production facility A and DP 1 is 784 KM)

Distance between locations

	A	B	C	DP 1	DP 2	DP 3	DP 4	DP 5
A	0	649	265	784	559	783	578	967
B	649	0	656	738	914	1201	833	683
C	265	656	0	514	909	766	356	1065
DP 1	784	738	514	0	507	907	1039	850
DP 2	559	914	909	507	0	1073	671	298
DP 3	783	1201	766	907	1073	0	603	1204
DP 4	578	833	356	1039	671	603	0	406
DP 5	967	683	1065	850	298	1204	406	0

Click on "Gentor" logo after you define everything.

Once you click on logo, Gentor will run for you. When it is completed, you will be redirected to a new sheet called "NP - Result". In this new sheet, you will find the path you can follow.

You should consider the rows as departure point and the columns as arrival point. You can find Gentor's proposal below:

- A -> DP 16 -> DP 46 -> DP 18 -> DP 13 -> DP 20
- A -> DP 21 -> DP 2 -> DP 19 -> DP 17 -> DP 23 -> DP 9 -> DP 31 -> DP 25 -> DP 41 -> DP 37
- A -> DP 22 -> DP 40 -> DP 42 -> DP 49 -> DP 27 -> DP 36 -> DP 39 -> DP 32 -> DP 6 -> DP 7 -> DP 1 -> DP 48
- A -> DP 43
- C -> DP 12
- C -> DP 26 -> DP 5 -> DP 29 -> DP 3 -> DP 15 -> DP 14 -> DP 11 -> DP 35 -> DP 4 -> DP 10 -> DP 50 -> DP 45 -> DP 33 -> DP 28 -> DP 8 -> DP 24 -> DP 38 -> DP 30 -> DP 34 -> DP 47 -> DP 44

	A	B	C	DP 1	DP 2	DP 3	DP 4	DP 5	DP 6	DP 7
A	0	0	0	0	0	0	0	0	0	0
B	0	0	0	0	0	0	0	0	0	0
C	0	0	0	0	0	0	0	0	0	0
DP 1	0	0	0	0	0	0	0	0	0	0
DP 2	0	0	0	0	0	0	0	0	0	0
DP 3	0	0	0	0	0	0	0	0	0	0
DP 4	0	0	0	0	0	0	0	0	0	0
DP 5	0	0	0	0	0	0	0	0	0	0
DP 6	0	0	0	0	0	0	0	0	0	1
DP 7	0	0	0	1	0	0	0	0	0	0

The next time you run Gentor, do not forget to click on "NO" button. Otherwise, Gentor will reset your work.
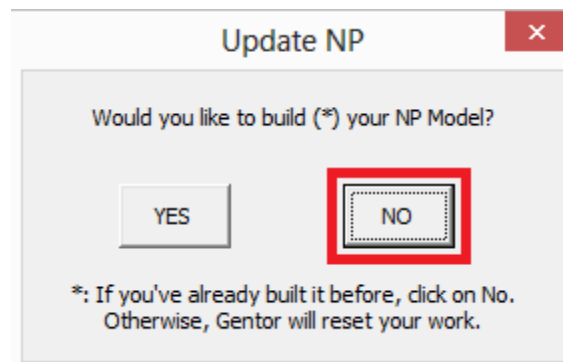
Videos

0. [Open Solver](#)
1. [MPS (Master Production Scheduling)](#)
2. [MRP (Materials Resource/Requirements Planning)](#)
3. [PS (Preference Scheduling)](#)
4. [CP (Capacity Planning)](#)
5. [NP (Network Planning)](#)

Click on link below to find out more information and download Gentor:

http://www.alpuzuner.com/gentor-optimization-model/