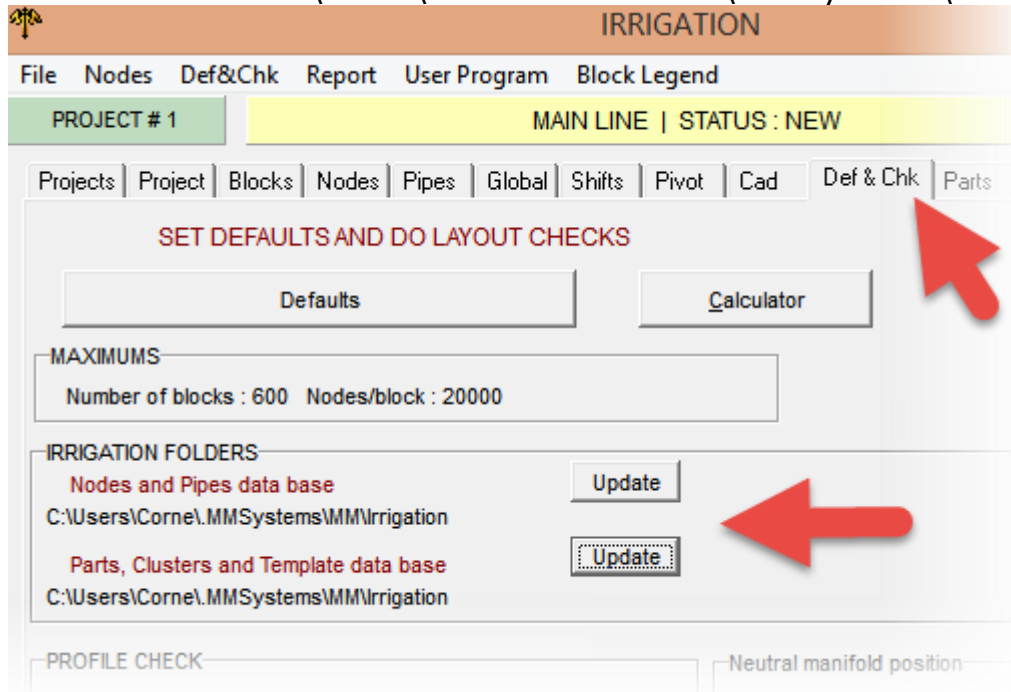


IrriMaker – Step by step – PART 2

In my previous article I showed you some tools that will guide you through some planning features. We also looked at how to divide an uneven area into 6 equally sized irrigation blocks. The next step would generally be to fill the blocks with irrigation components in order to do the design. Before we can fill the blocks with irrigation elements we need to have a proper database. I will therefore describe the database structure and how to add data to it.

It is useful to know where the database is located. By clicking on the Def & Chk Tab in IrriMaker you can use the Update button to define your irrigation database location anywhere on your computer. Please do not use the Irrigation_MAL folder as your default folder as this will cause possible data loss in the future. The default Irrigation folder is listed as c:\Users\YOUR USER NAME\.MMSystems\MM\Irrigation:

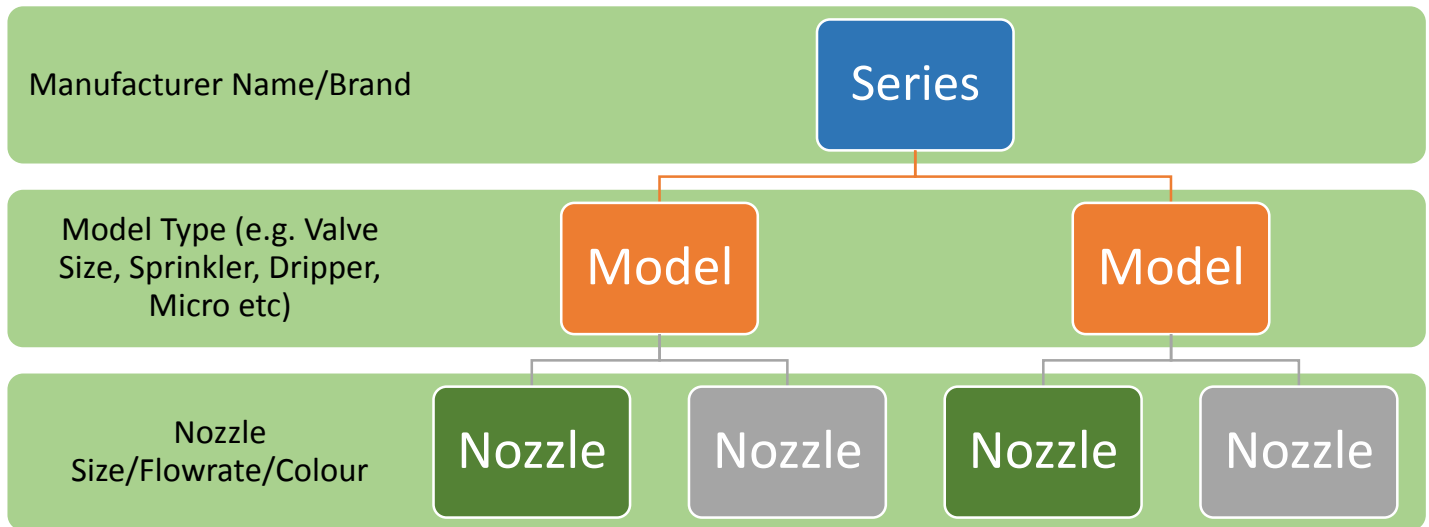


In IrriMaker there are two main database groups, one that contain the hydraulic information needed to do designs or calculations, the other to determine the bill of materials.

- A. The hydraulic database consist of three database files called IrrNode.dbf for nodes, IrrPipe.dbf for pipes and Irrdripper.dbf for dripline or microline combinations.
- B. The bill of material database consist of a parts.dbf file containing the parts list, a cluster.dbf file for combinations of parts and various template dbf files.

In this tutorial I will show you the recommended way to set up the nodes and pipes database in IrriMaker. To start, let's look at the Nodes database.

The nodes database have the following structure:



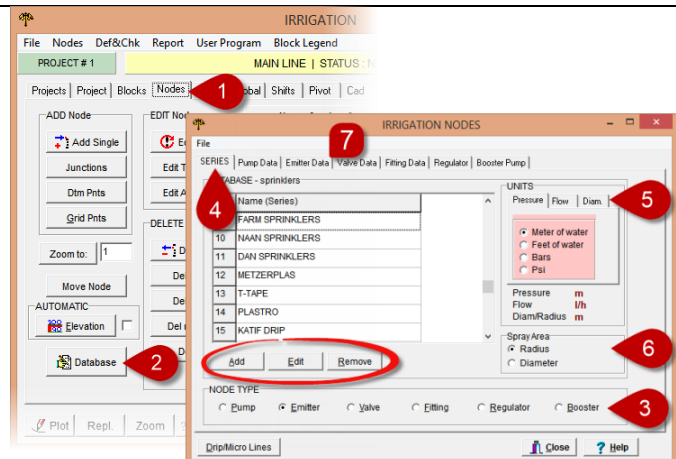
There are 6 types of nodes, they are

1. Pumps – Applicable only to the main line (Block 0)
2. Emitters – Any sprinkler/dripper/micro emitter
3. Valves – Applicable to Blocks and Mainline
4. Fittings – Applicable to Blocks and Mainline. Remember only fittings that have a hydraulic effect or that will influence BOM cluster assemblies.
5. Regulators - Applicable to Blocks and Mainline
6. Boosters - Applicable to Mainline

With these six node types we can design virtually any irrigation system. I teach my students that they should keep the database as minimalistic as possible.

1. It is not needed to build a database of *every* single irrigation part available in the marketplace to start to use IrriMaker. Start small and add only what is required for the first project. Build it up as you need more.
2. Only nodes that have a definite hydraulic effect (increase or decrease flow rate or pressure) should be added to the hydraulic databases. Do not add nuts, bolts, flanges etc. to this part of the database. That is what the Parts and Clusters databases are for when creating the bill of material.

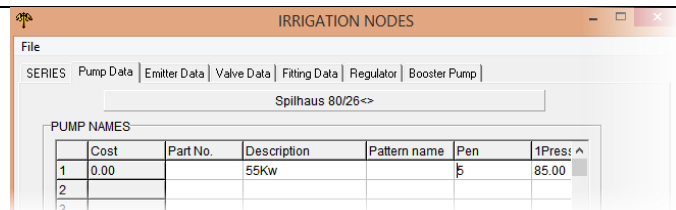
To access the Nodes database click on the Nodes page (1) then Database (2). The Nodes database will be displayed. At the bottom of the screen you will see the Node Type selector (3), select the type of node to be added or edited. Notice that the Series page (4) will display a list of the manufacturers (brand) of the specific node type you selected. Use the Add button to add a new series to the list, Edit – to edit the names that are already in the list or Remove. The units (5) need to be set up as per the manufacturers catalog units before you enter data into the database. IrriMaker will conveniently convert all data into liters per second and meters of pressure irrespective of the unit used to enter the data. There is therefore no need for the user to convert the data into specific units beforehand. Do not forget to set the Spray Area unit (6). Click on the respective Data (7) pages based on the Node Type (3) selected to enter the data values.



To add a pump node, click on Pump in the NODE TYPE (3) section, then click on Pump Data (4). Type in the necessary description, pen number and then the pressure with corresponding flow rate as found on the pump curve. It is possible to add a pump with a single low pressure and high flow rate to simulate gravity systems.

IMPORTANT: Pump nodes can only be used at pipe terminals that tee into a mainline. Pump nodes cannot be placed in series. Use Booster Node types to boost pressure in series.

Tip: Descriptions are limited by the number of characters that may be used, so test one or two entries by entering the data, then close the database and re-open it to see if your descriptions were truncated or not.



Emitter data is probably the most complex data field to enter because it consists of a model field (1) and each model have its own nozzle field (2) with its own data (3). Make extra sure that the correct emitter is selected by keeping an eye on the Series>Model>Nozzle name written in red at the top of the dialog before you enter new pressure/Flow/Spray Area information. Click back on SERIES (4) to save what you have entered.

IRRIGATION NODES

File | SERIES | Pump | Emmitter Data | Valve Data | Fitting Data | Regulator | Booster Pump

Model Names: 1 UniRam RC, 2 UniRam CNL, 3 DripNet PC, 4 Tiran, 5 Streamline

Nozzles:

Description	Cost	Pattern	Part No.	Pen
1 1.10 l/h	0.00	0	0	5
2 1.60 l/h	0.00	0	0	5
3 1.05 l/h	0.00	0	0	5

Pressure / Flow / Spray Area >> 1.10 l/h

	1	2	3	4	5	6	KD	Options	CV
Press. m	1.00	1.39	1.78	2.17	2.56	2.94			
Flow l/h	0.3920	0.4544	0.5078	0.5551	0.5979	0.6373			
Rad. m									

Pressure loss calculated by node: 0.00
KD factor: 0.00

Valve Data is almost the same as the pump data except it does not contain pressure and flow values. What it do contain is a valve diameter field (1) that is used to calculate losses in the main line. It is therefore important to add the correct valve inside diameter and K value (2) for the formula $[H=K*(V/2g)]$.

IRRIGATION NODES

File | SERIES | Pump Data | Emmitter Data | Valve Data | Fitting Data | Regulator | Booster Pump

STD VALVE

Valve Names:

Cost	Description	Pattern name	Secondary K	Pen	Diameter (mm)
0.00	50mm Hydraulic		5.4	15	50

Important: If no diameter value is supplied, IrriMaker will automatically use the inside diameter of the incoming pipe which could lead to incorrect head losses.

Fitting Data is very straight forward. Personally I choose to add the minimum number of fittings to my database, usually one or two with generic names like "Fitt" or "45deg bend" or "PVC Fitt" or "Plastic Fitting" etc. The reason for this is that IrriMaker has built in intelligence when it comes to the bill of material where it will analyze all the different pipe diameters connected to a fitting. This give us many different unique combinations of pipes connected to the same fitting type. Even though one fitting may be used in all those combinations of pipes, that is exactly what makes the cluster unique and I can therefore apply a different part number to each combination (cluster). The bill of material and part number assignment tutorial is described in an earlier article. You may download it from our website (www.mmsdesign.co.za).

Regulator Data contains a description (1) and a regulated pressure field (2). Here the regulated pressure is the pressure value you would like to see coming out of a specific node. This node type will only reduce pressure and cannot be used to boost pressure.

IRRIGATION NODES

File | SERIES | Pump Data | Emitter Data | Valve Data | Fitting Data | **Regulator** | Booster Pump

Regulator

PIPE TYPE to regulate
 0 = all pipes
 1 = only mainlines
 2 = only manifolds
 3 = only laterals

PRESSURE REGULATORS

	Cost	Part No.	Description	Pattern name	Reg. Press	Pipe Type	Second
1	0.00		39		39.00	0	0.00
2	0.00		11.8m		11.80	0	0.00
3	0.00		10m		10.00	0	0.00
4	0.00		30m		30.00	0	0.00

Booster Data has two settings that must be set, firstly the pressure value required (1) and secondly the Type (2) Absolute or Relative. If you set the type field to Absolute (or Yes) IrriMaker will raise the outlet pressure to the specified pressure (1). If the setting is Relative (or No) IrriMaker will add the pressure to the pressure it receives from the inlet side to the outlet side. For this reason booster nodes can also be called Filters because a negative pressure (1) will reduce the pressure with the Relative setting.

IRRIGATION NODES

File | SERIES | Pump Data | Emitter Data | Valve Data | Fitting Data | **Regulator** | **Booster Pump**

Filters

Booster Pump Type
☐ Absolute - Raise system pressure to Booster value (Yes)
☒ Relative - Add Booster pressure to system pressure (No)

BOOSTER PUMP

	Cost	Part No.	Description	Pattern name	Booster Pressure	Absolute	Se
1	0.00		Filter		-7.00	No	0.0

For each node type there is also a Part Number field, a Pattern Name and a Pen. The application for this is not so important for this tutorial. I will answer questions on these fields by email should you be interested.

The pipe database is much simpler. To access the pipes database click on the Pipes Tab (1) in IrriMaker then (2) Database. Add a new group of pipe (3) and start by typing in the group name in the Code (4) field. The Name field is very important as it describes the intended application of the pipe group. Enter one of three Names: Lat – for laterals, Man – for manifold and Main – for mainlines. This will assist us later when selecting pipes not to use the pipe for the wrong Application. I will say more about the Application in a later section. The Type field is descriptive and can be anything although we recommend using the National Standard description for that pipe group like SABS or ISO descriptions etc. The Pipe Names, Diameters, Maximum

IRRIGATION

File | Nodes | Def&Chk | Report | User Program | Block Legend

PROJECT #1 | MAIN LINE | STATUS: NEW

1 | Pipes | Global | Shifts | Pivot | Cad | Def & Chk | Parts

2 | Database

3 | Add new group of pipe data

4 | Code

5 | Name

6 | PIPE DIAMETERS

#	Name	OD	ID	Max press	Cost/m	Hazen	KD	Pen#	Part#
1	12/3	12,000	12,000	30.00	0.00	150.00	0.000	5	
2	15/3	15,000	15,000	30.00	0.66	150.00	0.000	11	7276
3	20/3	20,000	20,000	30.00	0.96	150.00	0.000	10	7277
4	25/3	25,000	25,000	30.00	1.34	150.00	0.000	7	7278
5	32/3	32,000	32,000	30.00	2.11	150.00	0.000	12	7279

Pressure, Hazen Williams Factor and Pen Number should be defined (5) for the different diameters.

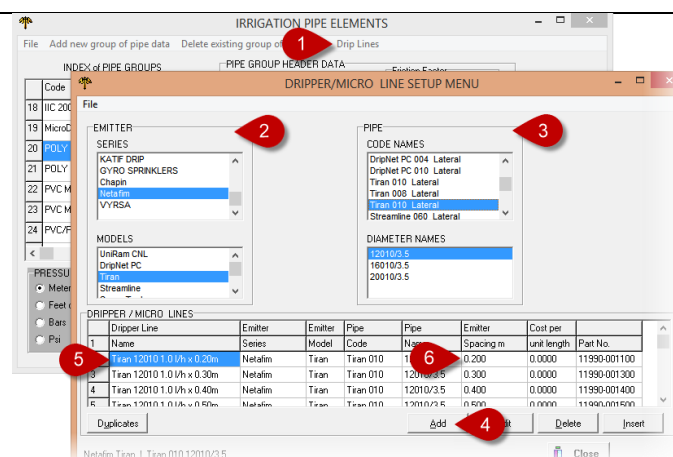
Tip: Double Click the Pen# field for each diameter to select a color from a list.

Tip: If you do not want IrriMaker to use a specific size of pipe when performing a pipe sizing calculation, you may omit that size from the pipe group. Pipe groups can also be customized and mixed (for example add small sized HDPE pipe and larger size PVC pipes into the same group).

Set the applicable units used for the pipe group (6) and press OK (7) to save your changes.

The third and final part of the hydraulic database is the drip line database. This is where a specific emitter series and model is assigned to a specific pipe diameter from a specific pipe group. To access the drip lines, you will find a Drip Lines button (1) inside the Pipe Database dialog. Start by selecting a suitable emitter Series and model (2) then a suitable pipe and diameter (3) and press the Add button (4). Now give the dripline you just added to the list a unique descriptive name (5), enter the required emitter spacing along the pipe (6) and a part number. Do not add the price per meter as it is not needed if you add a part number. The idea is that you only use prices in the Parts database. IrriMaker will reference prices from the parts database automatically when available.

Driplines will assist us when filling drip or micro designs with laterals and speed things up a bit. It also helps to eliminate accidental selection errors later on so it is well worth it to add a few combinations. Some suppliers can also supply you with a



comprehensive hydraulic database, so none of the typing is necessary. Get them to call me if you want to and I will provide them with the necessary information to build these databases on your behalf. You will then be able to import the files they supply.