UNIVERSITI PUTRA MALAYSIA

DETERMINATION OF IRRIGATION DELIVERY AT OIL PALM NURSERY

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ABSTRACT

The nursery main problem for palm oil nurseries is usually in irrigation which is often a clogging during irrigation for the plant. The project and this study focus more on clogging problems during irrigation. This thesis focuses on the issue of dripping system which is often a major problem for large-scale palm oil nurseries. In ensuring that pipeline flow has a major problem, this thesis introduces a method of District Metering Area (DMA) which is able to identify where the flow of pipes along a long flow in the nursery. Through this method, it capable to identify where a pipe flow has a clogging problem. This method can be applied by installing two pressure gauges at the upper flow and final flow area of the flow pipe. By installing these two pressure gauges, it capable to record the data for the flow rate and the pressure (bar) of a pipe flow. After collecting data for pipelines that are the main data to be the main graph for this experiment. Each dripping system installed must be tested in terms of flow rate for each dripping system installed. By collecting the data, we are able to draw conclusions as to where the occurrence of clogging or not on the long pipeline for a large nursery area.

ABSTRAK

Permasalahan pada nurseri bagi nurseri kelapa sawit kebiasaanya adalah semasa pengairan yang sering menjadi masalah utama iaitu tersumbat semasa menjalankan pengairan terhadap pokok. Projek dan kajian ini lebih mengutamakan kepada masalah tersumbat semasa pengairan di jalankan. Thesis ini memfokuskan kepada masalah sistem titisan yang sering menjadi masalah utama bagi nurseri kelapa sawit yang berskala besar. Dalam memastikan aliran paip yang mana mempunyai masalah utama, kajian ini memperkenalkan suatu kaedah " District Metering Area (DMA) " yang mampu mengenal pasti di mana aliran paip sepanjang suatu aliran yang panjang di dalam nurseri. Melalui kaedah ini, kita mampu mengenal pasti di mana satu aliran paip yang mempunyai masalah tersumbat. Kaedah ini boleh di aplikasikan dengan memasang dua tekanana tolok pada kawasan aliran atas dan aliran akhir pada paip aliran. Melalui pemasangan dua tekanan tolok ini, kita mampu merekodkan data bagi kadar aliran dan tekanan air bagi suatu aliran paip. Setelah mengumpulkan data bagi aliran paip yang menjadi data utama untuk di jadikan graf utama bagi eksperimen ini. Setiap sistem titisan yang di pasang harus di uji dari segi kadar aliran bagi setiap satu sistem titisan yang di pasang. Melalui pengumpulan data itu, kita mampu membuat kesimpulan bagi di keadaan di mana yang berlakunya tersumbat atau tidak pada aliran paip yang panjang bagi kawasan nurseri yang luas.

TABLE OF CONTENT

LIST FIGURES

LIST OF TABLES

LIST OF GRAPHS

CHAPTER 1

INTRODUCTION

1.1 Overview

The oil palm is an extremely precocious crop, which comes into development at 25 months or prior from field planting, with pick yield acknowledged at least four years thereafter.As early bearing and significant returns in the field are for the most part reliant on creation of consistently great and solid seedlings from a nursery, it pursues that great nursery the board would be required accomplish the latter.The generation of predominant oil palm planting materials is completely subject to thoughtfulness regarding subtleties at all phases in the nursery the board and this involves following firmly, demonstrated models and procedures. Oil palm has a financial profitable life expectancy of 20 years or more and any deficiencies in the planting material will have long haul outcomes on yield. All things considered, the cultivator must choose and plant just the best in his field so as to augment his yields (Heriansyah and Tan C.C. 2005).

Throughout the years, there have been various mechanical improvements in the field of irrigation system. Although all irrigation systems provide irrigation to plants, the strategies for doing as such fluctuate widely. Surface water system methods include covering a whole field with water. Overhead irrigation system wets the plants yet creates spillover. Conversely, irrigation water system is a considerably more controlled water system strategy. It works by presenting the roots to an immediate supply of water. This method is facilitated by the use of drip emitters, which discharge water in a gradual design. Drip emitters are little roughly the measure of a quarter and are situated on the ground, normally masterminded in columns. Drip emitters producers are associated with a water source by a feeder hose. Another variant of drip emitters water system utilizes a hose that has trickle producers incorporated with it. This minor departure from the dribble water system procedure is called stream tape.The most noteworthy advantage of a drip irrigation water system is the control that these strategies give. Likewise, these irrigation system methods are exceedingly efficient and exact.

1.2 Problem Statement

Drip irrigation methods do gives a great deal of advantages yet regardless it had its claim issue while inundate it as the framework conveyance are utilizing a small pipe line channel. The fundamental issue for this system for oil palm nursery water system is the clogging. This exploration is concentrating on the most proficient method to decide the irrigation delivery conveyance which is drip irrigation procedure that had been connected.

By knowing the required of exact flow rate that required as a pipe line stream and the head required so it very may be resolved the incentive to demonstrated on how the clogging circumstance is.

1.3 Objective

The aim of this study is to determine the irrigation delivery at oil palm nursery that been practiced. The specific objectives of this research are mainly :

a. To study the flow rate and head of the proposed system

b. To improve a method of irrigation delivery at oil palm nursery.

c. To suggest a method to monitoring the irrigation delivery at oil palm nursery.

1.4 Scope of Study

The study was conducted within the scope below :

a. Obtaining the data of oil palm nursery been applied.

b. Knowing the irrigation delivery at oil palm nursery.

c. Suggest a method of irrigation delivery at oil palm nursery.

1.5 Significant of study

District Metering Area (DMA) method fundamentally is to screen the water distribution system and comprise in dividing. This procedure will be acquired by setting an end the valves at along specific pipe lines that interfacing one DMA to another and putting a flow meter in the remaining associating channels (open connections) that dependent on estimated inflow and outpouring of each specific pipe lines. From this investigation, it will be a great information that will be helpful for oil palm nursery and a great method to take care of the clogging issues.

CHAPTER 2

LITERATURE REVIEW

2.1 District Metering Area (DMA)

A district metered area (DMA) is defined as a discrete area of a water dissemination arrange. It is generally made by shutting limit valves with the goal that it stays adaptable to evolving demands.

2.2 Determination of Irrigation Delivery at Oil Palm Nursery

It is conceivable to decide the water balance of the DMA and screen least flow, along these lines acquiring data that is helpful for distinguishing the nearness of leakage inside the region or non dissemination of water. In addition, the interest information gained at the DMA level can be viably utilized with regards to realtime framework the executives. Structuring the DMAs of a water appropriation framework can be distinguishing on the best way to assign the hubs of the system among the different areas so that each locale is satisfactory size. Its incorporates a sufficient number of clients/occupants, and deciding

(a) which pipes need to be closed off to delimit the DMA

(b) which pipes need to be left open with record those pressure.

With reference to this latter aspect, it is thus worth pointing out that while on the one hand partitioning a water distribution system into districts can bring significant benefits in terms of leakage reduction and real-time system management, on the other hand it can give rise to problems with respect to the reliability and efficiency of the system itself. District metering in fact contrasts with the approach typically adopted in the design of water distribution systems, which is based on the creation of highly looped networks which ensure high reliability. After a number of network pipes have been closed off by means of isolation valves in order to create a DMA, the network will have less of a loop structure, meaning that its reliability will be reduced; at the same time, more energy will be dissipated in the network, resulting in potential problems of ensuring minimum pressures at the nodes. The design of DMA thus represents a complex problem, especially in the case of real water distribution systems, which are often designed in successive stages and are typically not conceived with an eye to district metering. Several procedures have been proposed in the scientific literature to solve this problem; they are either decision support procedures (Tzatchkov et al. 2006; Perelman and Ostfeld 2011).

Due to the different conditions in different regions in the Malaysian Peninsula, such as in Sintok, Kedah (Figure 1), palms may suffer a water deficit of up to three months or more. Therefore, it is vital to correct such deficits. The objective of irrigation is to compensate for the rainfall shortage so that water is no longer a plant growth-limiting factor. The rate of application will depend on the amount of water and its distribution. The timing of irrigation is best determined from measurement of the plant water status based on stomatal behaviour and the application rate by the soil water deficit (Chan, 1979). One of the ways to alleviate a water deficit is to set up a drip irrigation system. The drip system applies water in small quantities directly to the rooting zone. It allows adjustment of the water supply to demand at any time and at the same time, limits the loss through percolation. Most drip systems require water at only a low pressure of 1.0-1.5 kg cm-2 compared to 3.5 kg cm-2 in standard irrigation (Kumar, 1997). The disadvantage of this system is that it requires thorough checking of the drippers, especially for operation after a long pause. With surface drip irrigation, the upper 150 mm soil layer is much more hydrated than with subsurface drip irrigation (Srinivas, 1996).

Water deficit hinders palm growth and yield. Thus, proper irrigation is needed to solve or minimize this problem. However, irrigation has its limits. It is very difficult to apply over large areas and therefore not easy to ensure its cost effectiveness. The yield of oil palm depends very much on its water supply. Sufficient water is thus vital for good yield. Irrigation system should be well maintained so that water can be applied as soon as a water deficit occurs. Routine and regular inspections of the inlet and the lines are necessary to ensure that all the palms receive a regular water supply as expected. In practice, irrigation for oil palm would be preferably applied in flat areas suffering periodic dryness and near to a water source.

CHAPTER 3

METHODOLOGY

Beginning from the chosen division arrangement, an ideal structure of the DMA system is performed by at the same time limiting the quantity of flow observations.The proposed plan methodology characterizes the genuine DMA beginning from the chose division . This method implies the technique that will figure out which slices identified with the picked arrangement can be "reasonable," for example flow estimations, or "genuine", for example valves (shut) and such choice needs to represent some usable destinations identified with the last reason for the areas arranging. By knowing which pipe line we need to monitor, this method capable to identify which pipe lines that facing a clogging problem by establish a simple method of DMA.

3.1 Flow Chart Study

Figure 3.1 shows the work process that had been done to evaluate the irrigation system for applying the DMA method. The works started with research from the literature review and planning by the knowing the layout for the experiment needed. From that established the DMA method by knowing the pressure (bar) and Flow rate (L/s) for the pipe line from the tap water. Those value will be implemented as a next further data needed for simulation in dripping system.

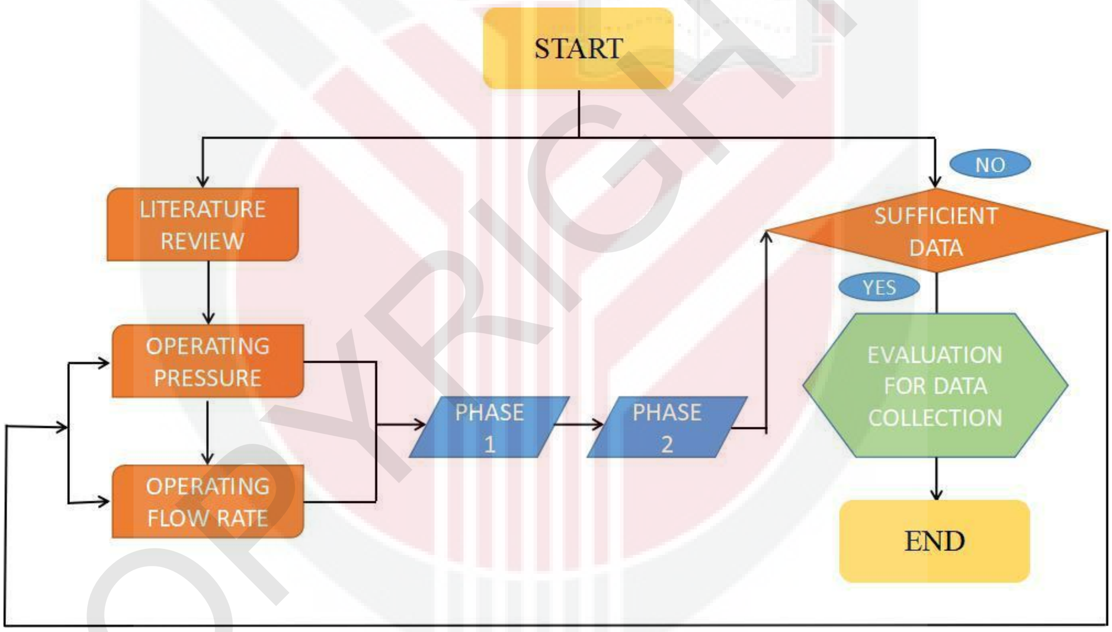


Figure 3.1 Flow Chart Study

3.2 (Phase 1) Establish method for pressure (bar) and Flow rate (L/s)

By establishing this method, (Phase 1) firstly get knowing the water requirement of the oil palm nursery that was 2 liter per day for a single ploy bag. This method use a poly pipe with 5 m long, 2 pressure gauge, 2 liter container as simulation for 2 liter water requirement and a stopwatch. From **figure 3.2** the data were collected as it been assembly as the simulation. From the simulation methods, it give a pressure (bar) value and a flow rate as water filled for 2 liter water requirement per second (time taken for it fill up the 4.0 liter water requirement. Those data will be collected with the certain value for a pressure (bar) until the valve at the tap water at the maximum state. After getting the exact pressure and those flow rate, the DMA can be established by applying the graph from pressure bar vs average flow rate. The exact loss (clogging) at the certain can be determined based on the graph and data collection.

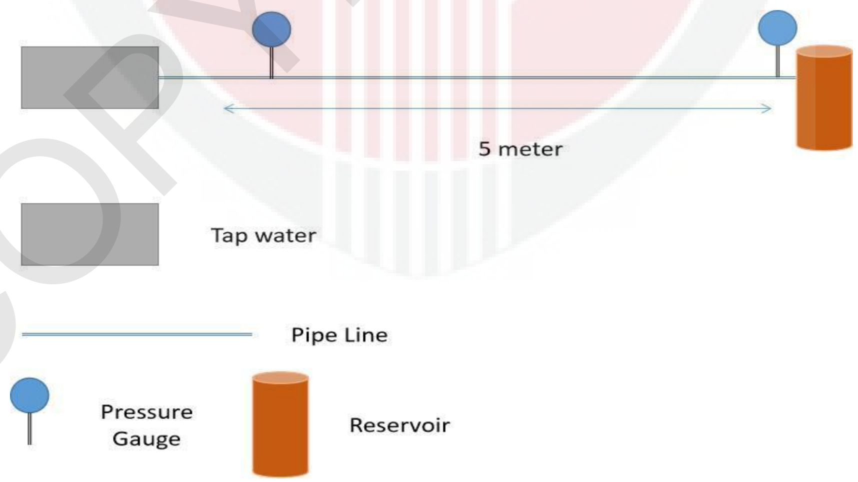


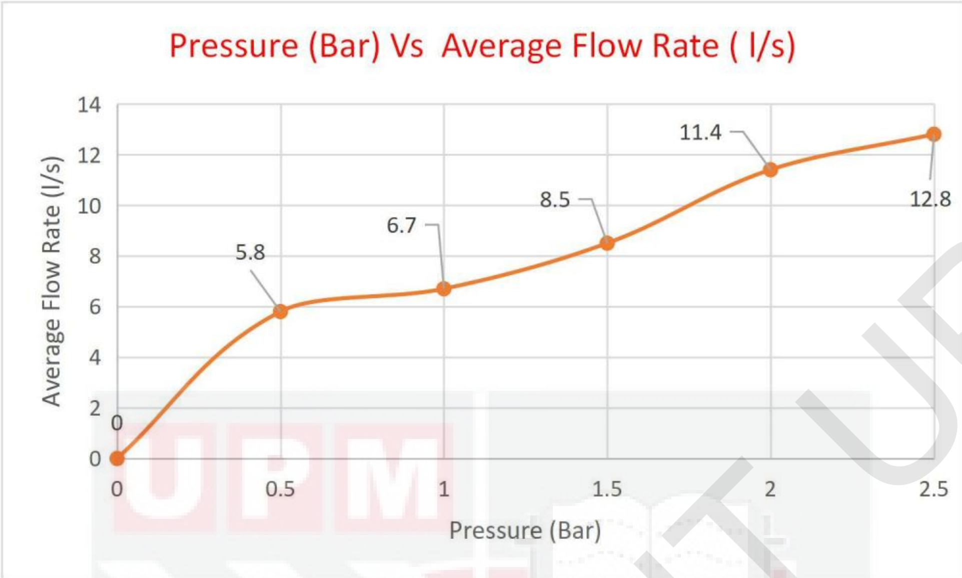
Figure 3.2 Simulation for Phase 1 Method

Pressure (Bar)	0.5	1.0	1.5	2.0	2.5
Flow Rate (l/s) 1	5.6	6.7	8.5	11.4	12.5
Flow Rate (l/s) 2	5.8	6.7	8.4	11.5	13.0
Flow Rate (l/s) 3	5.9	6.6	8.5	11.4	12.9
Total Flow Rate (l/s)	17.3	20.0	25.4	34.3	38.4
Average Flow Rate (l/s)	**5.8**	**6.7**	**8.5**	**11.4**	**12.8**

Table 3.1 : Based Data for Phase 1 Method

As the data were tabulated, the data collection was been done by establish the same as simulation for phase 1 method. The purpose by doing this to knowing the exact Pressure (bar) with the value of Flow Rate (l/s) which are for 0.5 bar, 1.0 bar, 1.5 bar, 2.0 bar and 2.5 bar as a maximum pressure. Those data represent are been done three times to getting the Average Flow Rate (l/s) for establish the Based Graph for Pressure (Graph) vs Average Flow Rate (L/s).

Graph : 3.1 Based Graph for Pressure (Bar) vs Average Flow Meter (L/s)



From the graph 3.3 (Phase 1) Pressure (Bar) vs Average Flow Rate (L/s) show the data that are increasing from 0 bar to 2.5 bar (maximum). It indicates a higher value of pressure (bar) the more value represent for the Average Flow Rate (L/s) as it a natural flow the more pressure (bar) in a long pipe stream line the more average flow rate (L/s) will be represented. After getting the exact pressure (bar) and those average flow rate (L/s), the DMA can be established by applying the graph from pressure bar vs average flow rate. The exact loss (clogging) at the certain pipe line can be determined based on the graph and data collection.

3.3 (Phase 2) Establishing DMA

Here are a set of criteria to create a **preliminary DMA design**. They must be tested either in the field or using a network model:

- Size of DMA
- Pressure along stream line
- Situation simulation
- Flow rate for each drip system

(Simulation Figure for 16 dripping system)

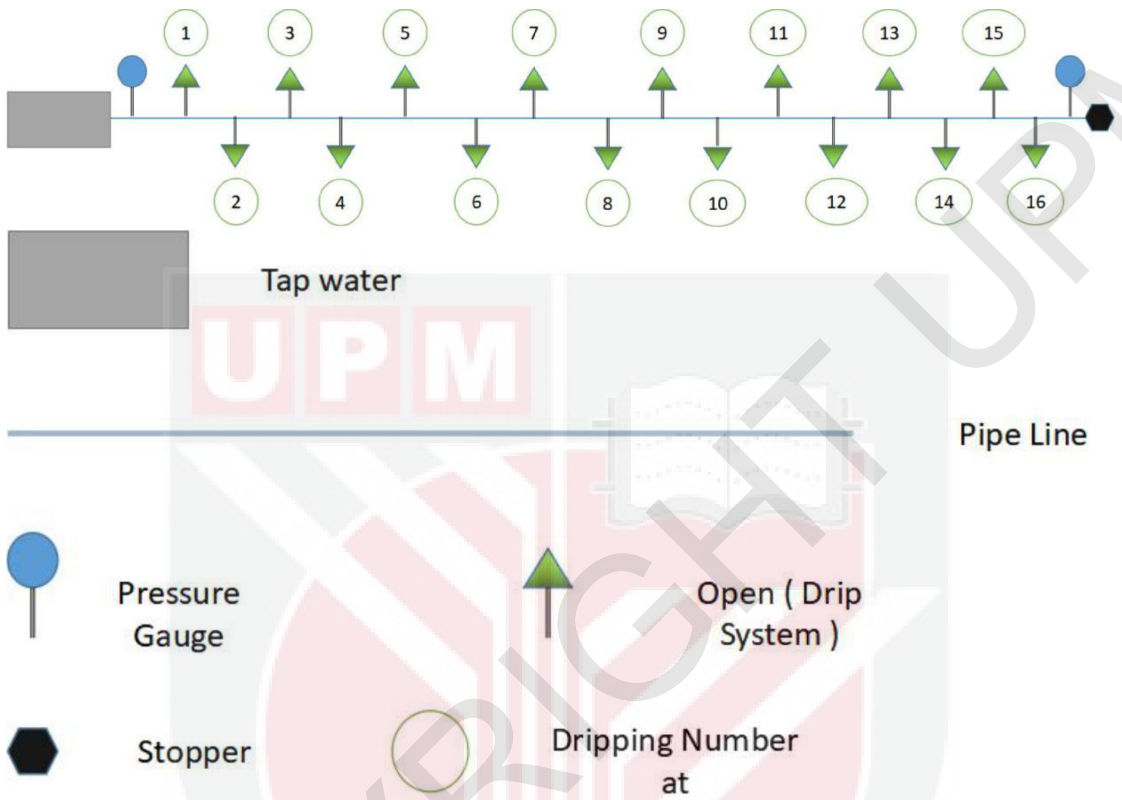


Figure 3.3 16 dripping system

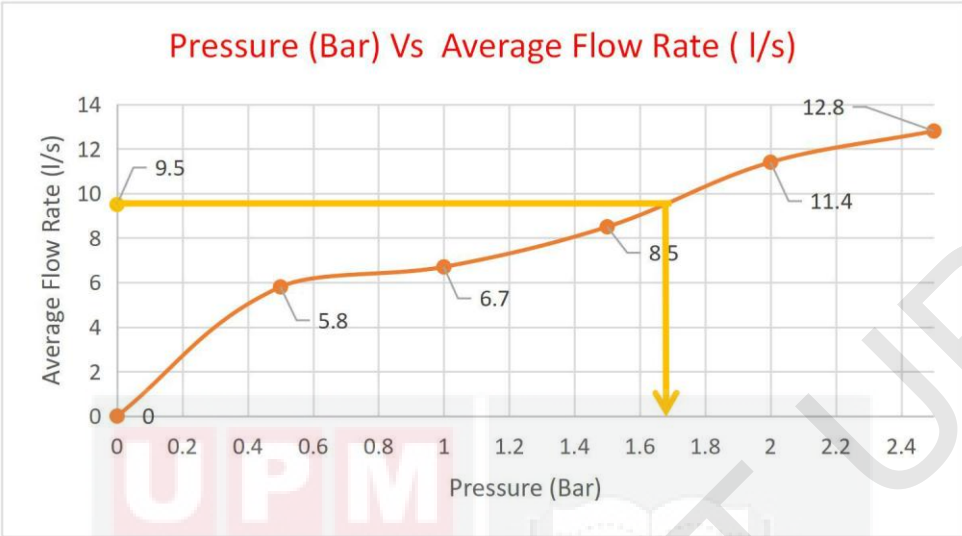
Figure 3.3 show a simulation figure on how the experiment at the second phase was conducted. At first the pipe line will be attached with 16 dripping system that along 5 meter pipe line. As it been attached the data was collected by open the maximum pressure (bar) tap water at 2.5 bar and collect all the data needed.

Phase 2 Establish DMA

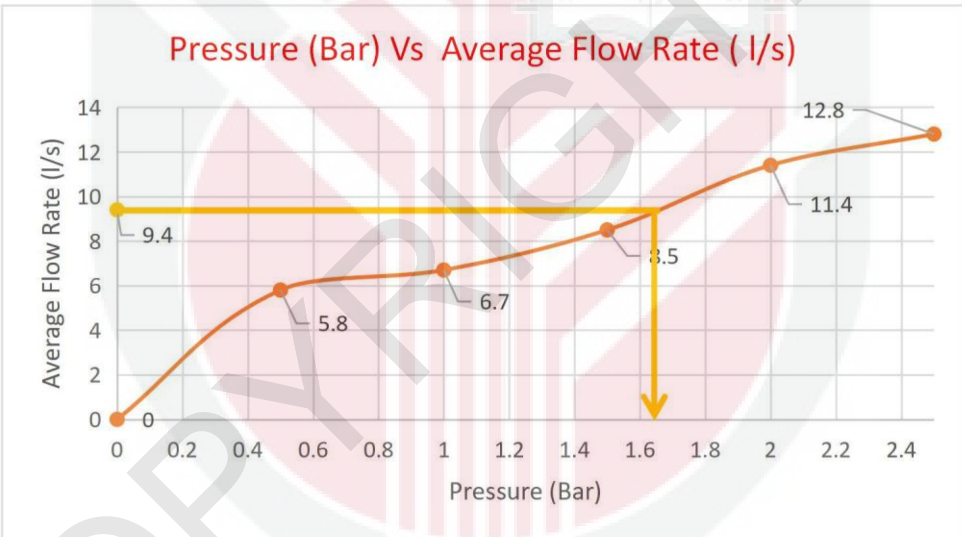
Situation		Flow Rate (L/s)			Total Flow Rate (L/s)	Average Flow Rate (L/s)
		Attempt 1	Attempt 2	Attempt 3		
Clogging	Open					
-	**1**	9.3	9.7	9.5	28.5	9.50
	2	9.4	9.2	9.6	28.2	9.40
	3	9.0	9.0	9.5	27.51	9.17
	4	9.5	9.5	9.4	28.4	9.47
	5	9.3	9.0	9.1	27.4	9.13
	6	9.6	9.4	9.2	28.2	9.40
	7	9.1	9.1	9.1	27.3	9.10
	8	9.3	9.6	9.4	28.3	9.43
	9	9.5	9.7	9.0	28.2	9.40
	10	9.3	9.0	9.3	27.6	9.20
	11	9.6	9.0	9.1	27.7	9.23
	12	9.1	9.5	9.1	27.7	9.23
	13	9.0	9.5	9.0	27.5	9.17
	14	9.1	9.4	9.4	27.9	9.30
	15	9.1	9.5	9.0	27.6	9.20
	16	9.4	9.4	9.5	28.3	9.43

Table 3.2 : Data Distribution for 16 dripping system at maximum Pressure 2.5 bar

Graph : 3.2 (16 open dripping system)



At Dripping No 1



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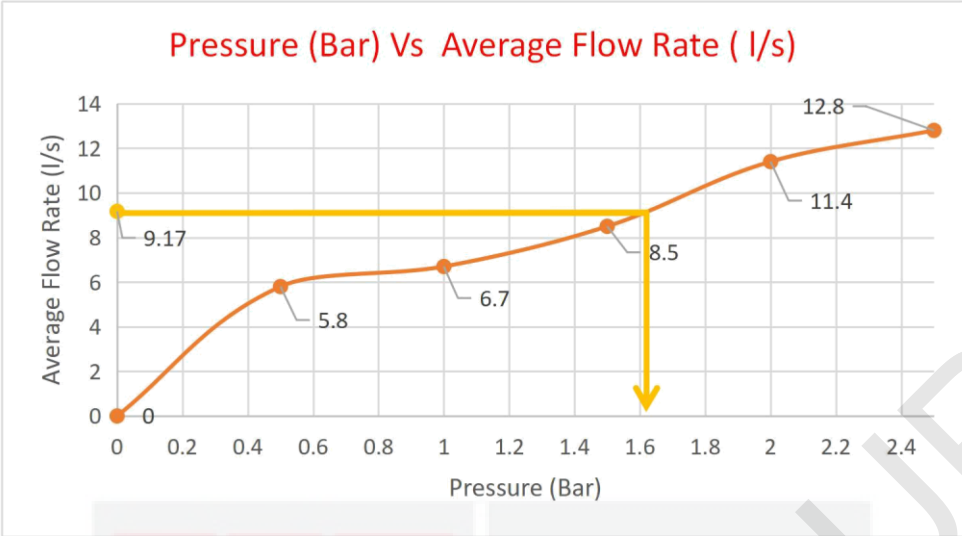

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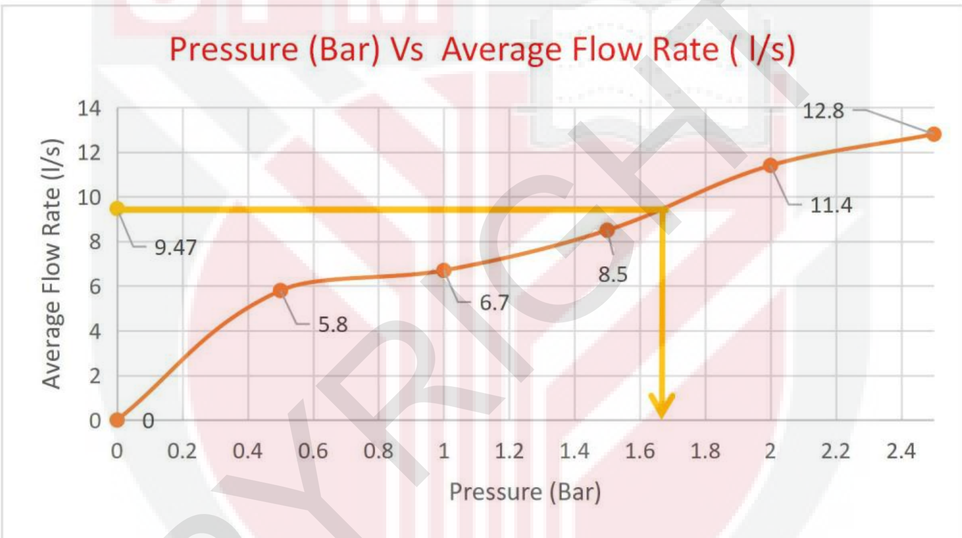

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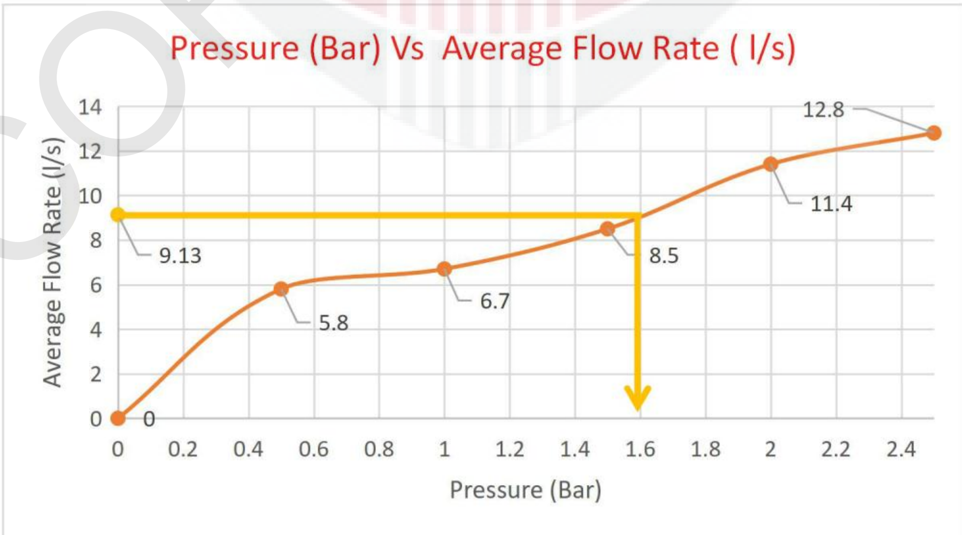

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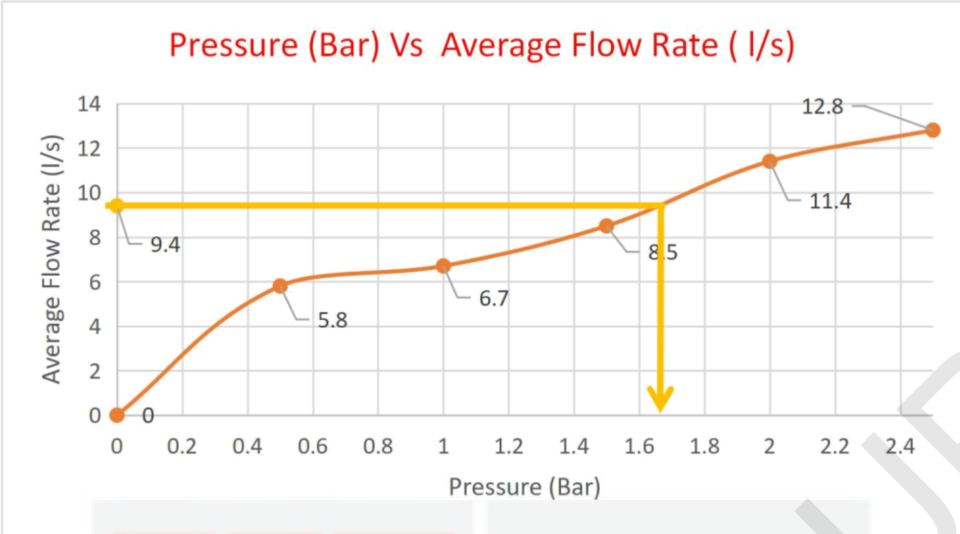

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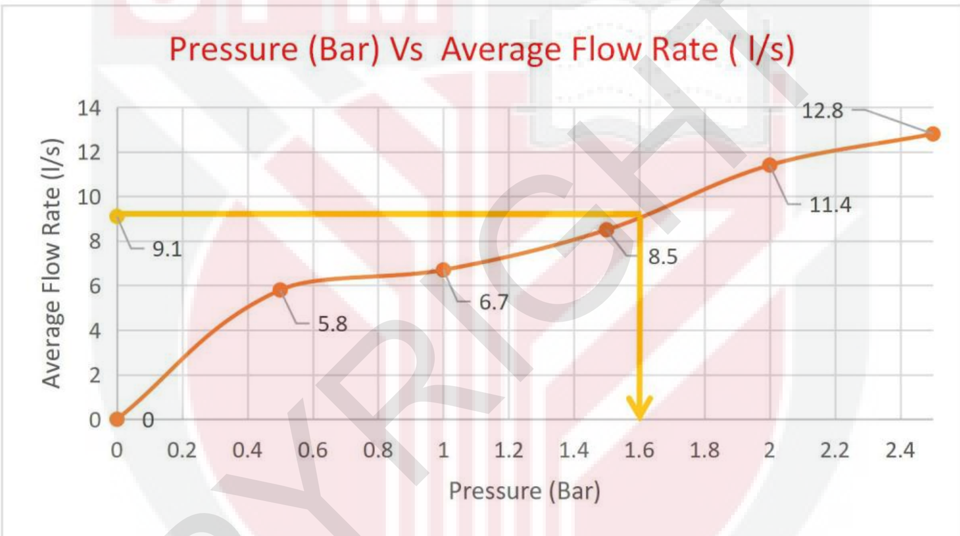

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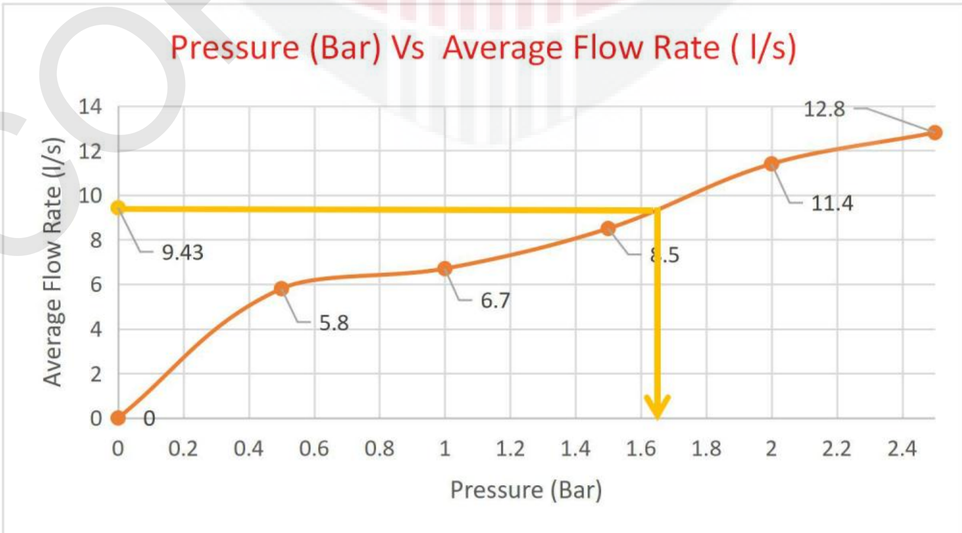

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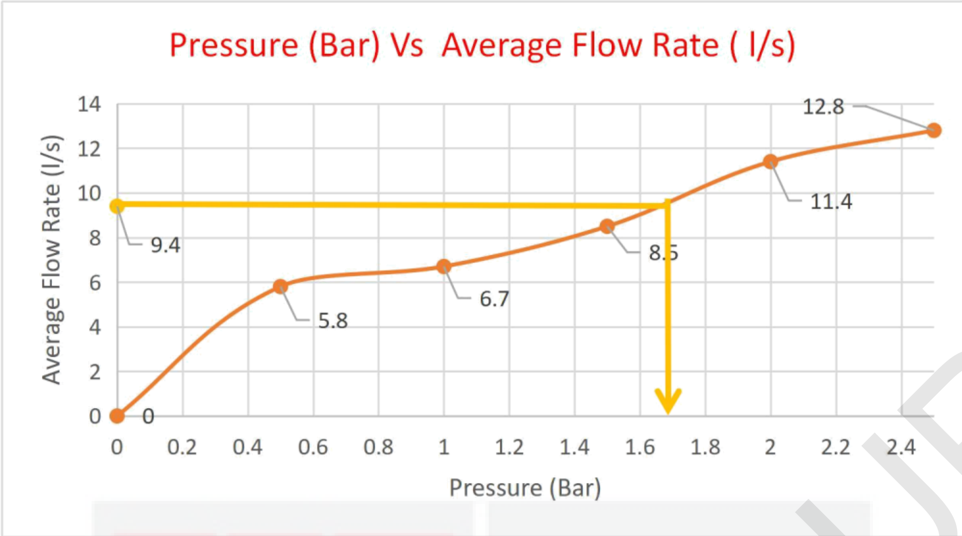

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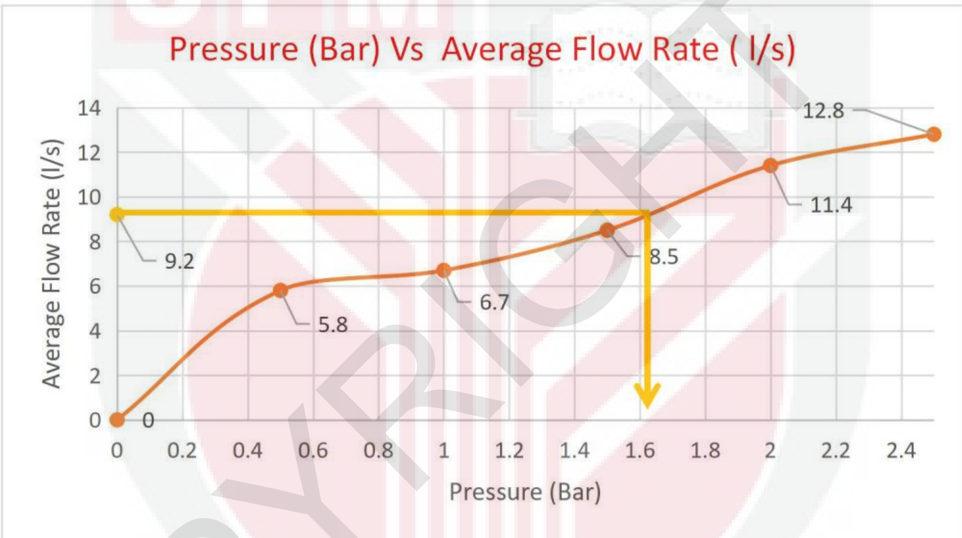

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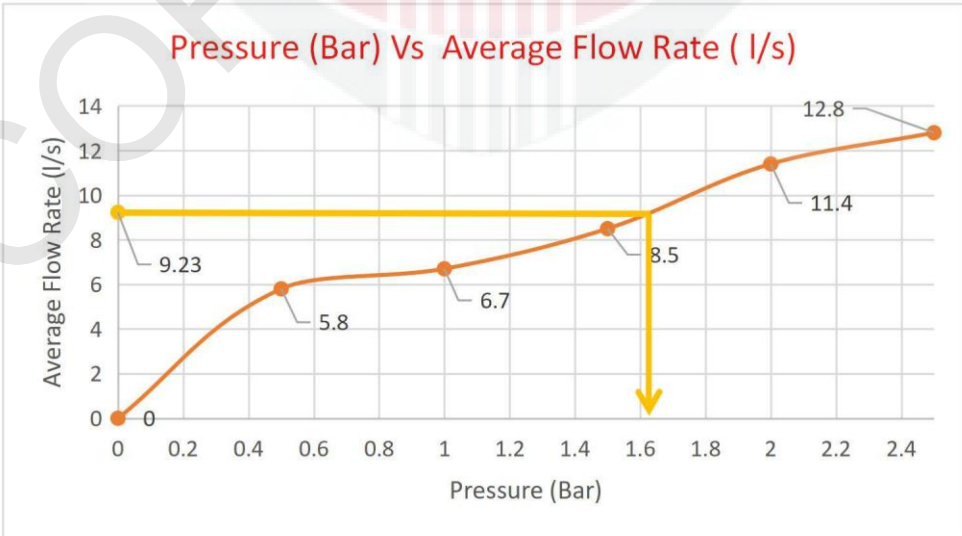

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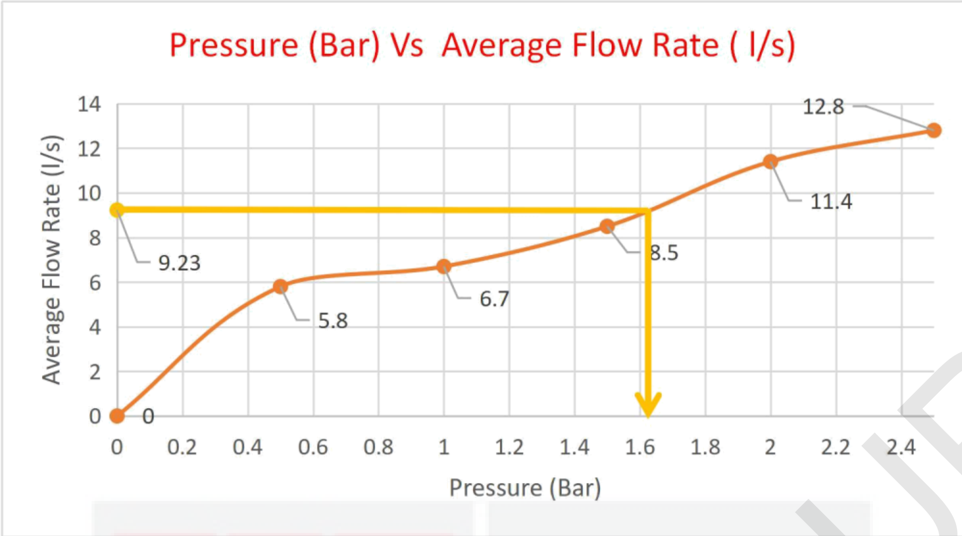

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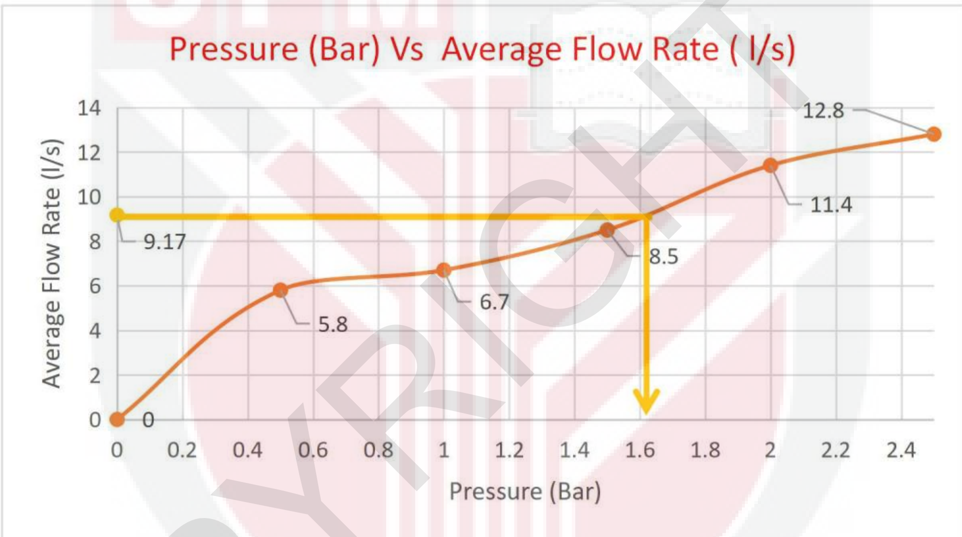

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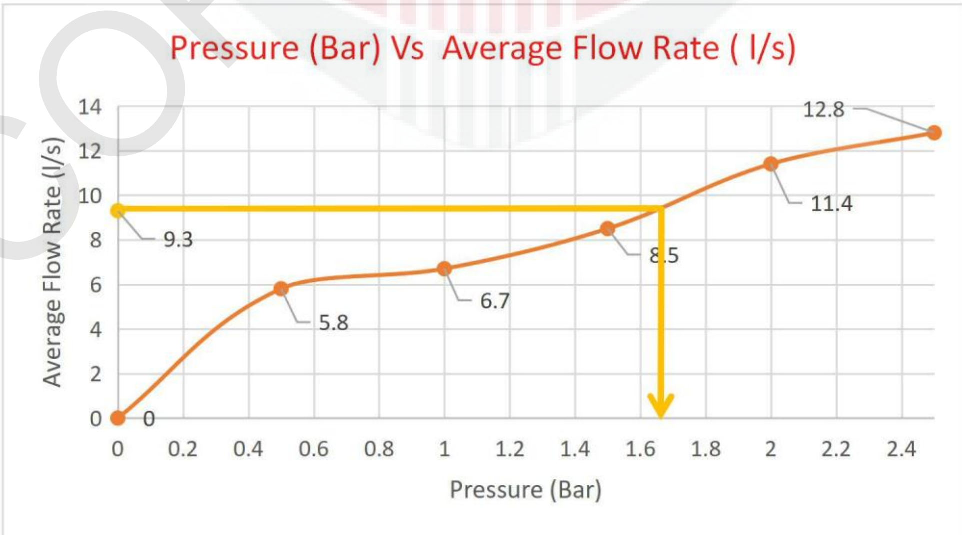

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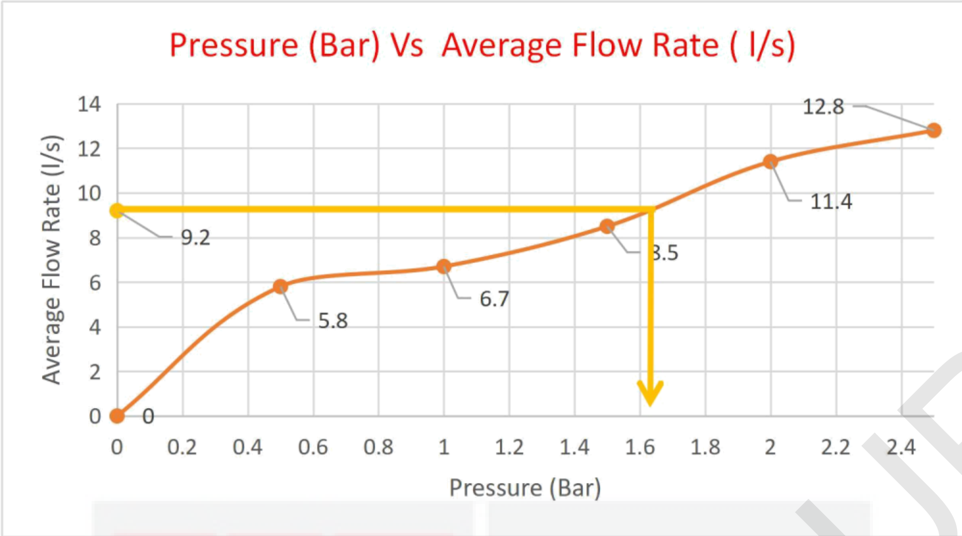
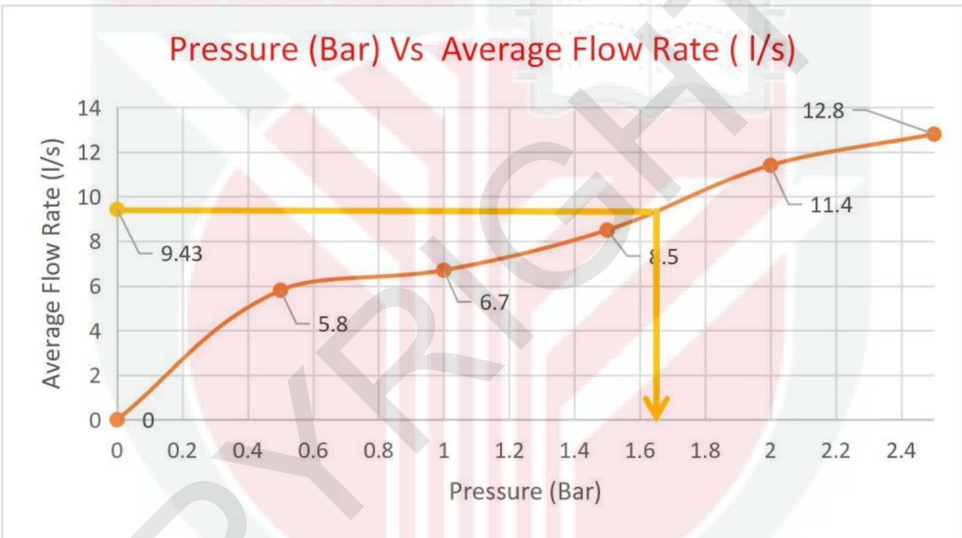


At Dripping No 15



At Dripping No 16

Dripping Number at	Average Flow Rate (L/s)	Pressure (Bar)
1	9.50	1.70
2	9.40	1.60
3	9.17	1.61
4	9.47	1.68
5	9.13	1.60
6	9.40	1.64
7	9.10	1.60
8	9.43	1.64
9	9.40	1.61
10	9.20	1.61
11	9.23	1.61
12	9.23	1.61
13	9.17	1.61
14	9.30	1.64
15	9.20	1.63
16	9.43	1.62

Table 3.3 : Result for 16 dripping system

As the data was tabulated, the range for normal flow for pressure was 1.6 bar to 1.70 bar. This data as a references for the normal flow that along 5 m pipeline should be as it at normal flow with 2.5 bar pressure delivery that not facing any clogging situation. This data will be compare with different clogging situation at certain situation.

Situation		Flow Rate (L/s)			Total Flow Rate (L/s)	Average Flow Rate (L/s)
		Attempt 1	Attempt 2	Attempt 3		
Clogging	Open					
1	16	9.2	9.2	9.1	27.5	9.17
	15	9.3	9.2	9.3	27.8	9.27
	14	9.3	9.3	9.3	27.9	9.30
	13	9.4	9.3	9.4	28.1	9.37
	12	9.5	9.4	9.4	28.3	9.43
	11	9.5	9.5	9.4	28.4	9.47
	10	9.6	9.7	9.6	28.9	9.63
	9	9.6	9.7	9.8	29.1	9.70
	8	9.8	9.9	10.0	29.7	9.90
	7	10.0	10.0	10.0	30.0	10.00
	6	10.0	10.1	10.0	30.1	10.03
	5	10.5	9.9	10.3	30.7	10.23
	4	10.8	10.5	11.0	32.3	10.76
	3	11.0	11.2	11.6	33.8	11.27
	2	11.6	12.0	11.6	35.2	11.73

Table 3.4 : Data Distribution for 15 dripping system at maximum Pressure 2.5 bar

Dripping Number at	Average Flow Rate (L/s)	Pressure (Bar)
16	9.17	1.62
15	9.27	1.63
14	9.30	1.66
13	9.37	1.68
12	9.43	1.69
11	9.47	1.7
10	9.63	1.69
9	9.70	1.71
8	9.90	1.75
7	10.00	1.76
6	10.03	1.78
5	10.23	1.79
4	10.76	1.82
3	11.27	1.9
2	11.73	2.0

Table 3.5 : Result for 15 dripping system after derived from based graph for Pressure (Bar) vs Average Flow Meter (L/s)

Situation		Flow Rate (L/s)			Total Flow Rate (L/s)	Average Flow Rate (L/s)
		Attempt 1	Attempt 2	Attempt 3		
Clogging	Open					
1 , 2 & 3	16	9.3	9.3	9.3	27.9	9.30
	15	9.4	9.3	9.4	28.1	9.37
	14	9.5	9.4	9.4	28.3	9.43
	13	9.5	9.5	9.4	28.4	9.47
	12	9.6	9.7	9.6	28.9	9.63
	11	9.6	9.7	9.8	29.1	9.70
	10	9.8	9.9	10.0	29.7	9.90
	9	10.0	10.0	10.0	30.0	10.00
	8	10.0	10.1	10.0	30.1	10.03
	7	10.5	9.9	10.3	30.7	10.23
	6	10.8	10.5	11.0	32.3	10.76
	5	11.0	11.2	11.6	33.8	11.27
	4	11.6	12.0	11.6	35.2	11.73

Table 3.6 : Data Distribution for 13 dripping system at maximum Pressure 2.5 bar

Dripping Number at	Average Flow Rate (L/s)	Pressure (Bar)
16	9.30	1.66
15	9.37	1.68
14	9.43	1.69
13	9.47	1.7
12	9.63	1.69
11	9.70	1.71
10	9.90	1.75
9	10.00	1.76
8	10.03	1.78
7	10.23	1.79
6	10.76	1.82
5	11.27	1.9
4	11.73	2.0

Table 3.7 : Result for 13 dripping system after derived from based graph for Pressure (Bar) vs Average Flow Meter (L/s)

Situation		Flow Rate (L/s)				Total Flow Rate (L/s)	Average Flow Rate (L/s)
		[redacted]	Attempt 1	Attempt 2	Attempt 3		
Clogging	**Open**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1 , 2 , 3, 4 & 5	**16**	[redacted]	9.5	9.4	9.4	28.3	9.43
	15	[redacted]	9.5	9.5	9.4	28.4	9.47
	14	[redacted]	9.6	9.7	9.6	28.9	9.63
	13	[redacted]	9.6	9.7	9.8	29.1	9.70
	12	[redacted]	9.8	9.9	10.0	29.7	9.90
	11	[redacted]	10.0	10.0	10.0	30.0	10.00
	10	[redacted]	10.0	10.1	10.0	30.1	10.03
	9	[redacted]	10.5	9.9	10.3	30.7	10.23
	8	[redacted]	10.8	10.5	11.0	32.3	10.76
	7	[redacted]	11.0	11.2	11.6	33.8	11.27
	6	[redacted]	11.6	12.0	11.6	35.2	11.73

Table 3.8 : Data Distribution for 11 dripping system at maximum Pressure 2.5 bar

Dripping Number at	Average Flow Rate (L/s)	Pressure (Bar)
16	9.43	1.69
15	9.47	1.7
14	9.63	1.69
13	9.70	1.71
12	9.90	1.75
11	10.00	1.76
10	10.03	1.78
9	10.23	1.79
8	10.76	1.82
7	11.27	1.9
6	11.73	2.0

Table 3.9 : Result for 11 dripping system after derived from based graph for Pressure (Bar) vs Average Flow Meter (L/s)

Situation			Flow Rate (L/s)			Total Flow Rate (L/s)	Average Flow Rate (L/s)
			Attempt 1	Attempt 2	Attempt 3		
Clogging	**Open**						
1 , 2 , 3, 4, 5, 6 & 7	**16**		9.6	9.7	9.6	28.9	9.63
	15		9.6	9.7	9.8	29.1	9.70
	14		9.8	9.9	10.0	29.7	9.90
	13		10.0	10.0	10.0	30.0	10.00
	12		10.0	10.1	10.0	30.1	10.03
	11		10.5	9.9	10.3	30.7	10.23
	10		10.8	10.5	11.0	32.3	10.76
	9		11.0	11.2	11.6	33.8	11.27
	8		11.6	12.0	11.6	35.2	11.73

Table 3.10 : Data Distribution for 9 dripping system at maximum Pressure 2.5 bar

Dripping Number at	Average Flow Rate (L/s)	Pressure (Bar)
16	9.63	1.69
15	9.70	1.71
14	9.90	1.75
13	10.00	1.76
12	10.03	1.78
11	10.23	1.79
10	10.76	1.82
9	11.27	1.9
8	11.73	2.0

Table 3.11 : Result for 9 dripping system after derived from based graph for Pressure (Bar) vs Average Flow Meter (L/s)

Situation		Flow Rate (L/s)			Total Flow Rate (L/s)	Average Flow Rate (L/s)
		Attempt 1	Attempt 2	Attempt 3		
Clogging	Open					
1 , 2 , 3, 4, 5 , 6, 7, 8 & 9	16	9.8	9.9	10.0	29.7	9.90
	15	10.0	10.0	10.0	30.0	10.00
	14	10.0	10.1	10.0	30.1	10.03
	13	10.5	9.9	10.3	30.7	10.23
	12	10.8	10.5	11.0	32.3	10.76
	11	11.0	11.2	11.6	33.8	11.27
	10	11.6	12.0	11.6	35.2	11.73

Table 3.12 : Data Distribution for 7 dripping system at maximum Pressure 2.5 bar

Dripping Number at	Average Flow Rate (L/s)	Pressure (Bar)
16	9.90	1.75
15	10.00	1.76
14	10.03	1.78
13	10.23	1.79
12	10.76	1.82
11	11.27	1.9
10	11.73	2.0

Table 3.13 : Result for 7 dripping system after derived from based graph for Pressure (Bar) vs Average Flow Meter (L/s)

Situation		Flow Rate (L/s)			Total Flow Rate (L/s)	Average Flow Rate (L/s)
		Attempt 1	Attempt 2	Attempt 3		
Clogging	Open					
1 , 2 , 3, 4, 5 , 6, 7, 8 ,9 ,10 & 11	16	10.0	10.1	10.0	30.1	10.03
	15	10.5	9.9	10.3	30.7	10.23
	14	10.8	10.5	11.0	32.3	10.76
	13	11.0	11.2	11.6	33.8	11.27
	12	11.6	12.0	11.6	35.2	11.73

Table 3.14 : Data Distribution for 5 dripping system at maximum Pressure 2.5 bar

Dripping Number at	Average Flow Rate (L/s)	Pressure (Bar)
16	10.03	1.78
15	10.23	1.79
14	10.76	1.82
13	11.27	1.9
12	11.73	2.0

Table 3.15 : Result for 5 dripping system after derived from based graph for Pressure (Bar) vs Average Flow Meter (L/s)

Situation		Flow Rate (L/s)				Total Flow Rate (L/s)	Average Flow Rate (L/s)
		[redacted]	Attempt 1	Attempt 2	Attempt 3		
Clogging	**Open**	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1 , 2 , 3, 4, 5 , 6, 7, 8 ,9 ,10, 11, 12 & 13	**16**	[redacted]	10.8	10.5	11.0	32.3	10.76
	15	[redacted]	11.0	11.2	11.6	33.8	11.27
	14	[redacted]	11.6	12.0	11.6	35.2	11.73

Table 3.16 : Data Distribution for 3 dripping system at maximum Pressure 2.5 bar

Dripping Number at	Average Flow Rate (L/s)	Pressure (Bar)
16	10.76	1.82
15	11.27	1.9
14	11.73	2.0

Table 3.17 : Result for 3 dripping system after derived from based graph for Pressure (Bar) vs Average Flow Meter (L/s)

Situation		Flow Rate (L/s)				Total Flow Rate (L/s)	Average Flow Rate (L/s)
			Attempt 1	Attempt 2	Attempt 3		
Clogging	Open						
1 , 2 , 3, 4, 5 , 6, 7, 8 ,9 ,10, 11, 12, 13, 14, & 15	**16**		11.6	12.0	11.6	35.2	11.73

Table 3.18 : Data Distribution for 1 dripping system at maximum Pressure 2.5 bar

Dripping Number at	Average Flow Rate (L/s)	Pressure (Bar)
16	11.73	2.0

Table 3.19 : Result for 1 dripping system after derived from based graph for Pressure (Bar) vs Average Flow Meter (L/s)

CHAPTER 4

RESULT

4.1 Pressure (Bar) Range for Normal Flow Situation

Pressure (Bar) Range for Normal Flow Situation is indicated as the 16 drip system been assembled with a normal flow. Normal flow means the dripping system is operating at normal state that there is no clogging or a leakage. By establishing the 16 drip system we get a result that at in front of pressure gauge at 1.8 bar and at the back 1.5 bar as the table 4.1 below. This two values indicate the pressure at the nearest of water source that is 1.8 bar which is tap water and at the end of pipe line that is 1.5 bar. By applying this two pressure gauge we already knew that the pressure along pipe line will be only within the range 1.8 bar until 1.5 bar as the tap water been opened that should deliver 2.5 bar (maximum) as we already getting those value at the first phase of experiment. With the pressure (bar) range for normal flow situation is within 1.7 bar and 1.6 bar. It is been proven the dripping system is at the best fit of delivery for delivery the water for the plant within the range of 1.8 bar and 1.5 bar. For the problem that might occur at the nursery such as clogging, by applying this kind method (DMA) by at first knowing the Pressure (Bar) Range for normal flow situation it will given a great data as table 4.1 we knew that the maximum water delivery that we deliver and the exact will pass through and the lost will be occur. As we apply the first phase of experiment we can get the exact pressure and the loss depending on the length and the size of spacing as we set for 5 meter the spacing 1 feet as we get 16 dripping system delivery. As the more length that we design or layout been implement for our nursery delivery the more dripping system that we need to consider. Basically by knowing the pressure at the in front and at the back of our pipe line, build a data for based data and getting the each flow rate at the each dripping that we assembly we can get the range of our pressure delivery that can be refer as we need to refer the pressure at the up stream of pipeline and at the down stream of the pipeline. We can prove that we deliver the right water delivery at the right pressure for requirement at 2 Liter per poly bag.

Length (M)	Number of dripping	Pressure (Bar) Range for Normal Flow Situation	Pressure Gauge (bar) Up stream	Pressure Gauge (bar) Down Stream
5	16	1.7 -1.6	1.8	1.5

Table 4.1 : Result Pressure (Bar) Range for Normal Flow Situation

Description	Pressure Gauge
Pressure gauge at the up stream of pipe line	 **1.8 Bar**
Pressure gauge at the down stream pipe line	 **1.5 bar**

Figure 4.1 : Pressure Gauge Image

4.2 Pressure (Bar) Range for Clogging Flow Situation

Pressure (bar) for clogging flow situation are designed to make a simulation on how if 5 meter with 16 dripping system occur a clogging. Those data at the table at methodology represent as the simulation if clogging occur from 1 to 15 dripping system along the pipe line. By knowing the pressure (bar) range for clogging situation we can verify the pressure along the pipe line for pressure gauge at in front and at the back. From the data collection, we get the value for the pressure gauge (bar) at the in front of pipe line was 2.0 bar and at the back 1.5 bar. As the pressure (bar) range for clogging flow situation is 2.0 bar until 1.7 bar it is verify that the value is within the range for the pressure (bar) at the pressure gauge along the pipe line at in front and at the back for the pipe line. To verify this prediction, first we must knowing the pressure (bar) range for normal flow range and the pressure gauge value along the pipe line at in front of pipe line and at the back of pipe. After we get those value by apply those method at the first phase we can get those needed value and applying the second phase. The pressure (bar) range for clogging flow situation is to determine along the pipe line is there any clogging occur based on pressure gauge value.By knowing the pressure (bar) for normal range flow and clogging flow we can identify which pipe line that we need to monitor most. If the pressure along the pipe line is not at a normal flow situation as we already knew the range, it indicates more as the pressure at clogging situation as table 4.2 below it shows a clogging situation and can be verify by monitoring a long the pipe line and by getting a view on the condition of leaves it self as a greater evidence of lack of watering. As we design or manage with a big scale of nursery by applying this method DMA as usually use for control water flow or monitoring in a housing area, we can implement it with a simple method by knowing the pressure (bar), flow rate (l/s)

Length (M)	Number of Dripping (Clogging)	Number of Dripping (open)	Pressure (Bar) range for Clogging Flow Situation	Pressure Gauge (bar) Up stream	Pressure Gauge (bar) Down Stream
5	1	2-16	2.0 - 1.62	2.0	1.5
	1-3	4-16	2.0 - 1.66		
	1-5	6-16	2.0 - 1.69		
	1-7	8-16	2.0 - 1.69		
	1-9	10-16	2.0 - 1.75		
	1-11	12-16	2.0 - 1.78		
	1-13	14-16	2.0 - 1.82		
	1-15	16	2.0		

Table 4.2 : Result Pressure (Bar) range for Clogging Flow Situation

Description	Pressure Gauge
Pressure gauge at the up stream of pipe line	 **2.0 Bar**
Pressure gauge at the down stream pipe line	 **1.5 bar**

Figure 4.2 : Pressure Gauge images

DISCUSSION

This study basically is focusing on how to monitor the problem that been face at nursery oil palm nursery. It is still on a progress for a method of District Metering Area that can identify the clogging problem that they face it. Clogging are main concern that they rarely face as the oil palm nursery are at a large scale practice that needed to be monitored. Oil palm nursery are the most important section for determine the growth and efficiency of the oil palm itself. By applying this method we can monitor which pipe lines that we need to monitor most. Hopefully by applying this kind of method it will solve the problem as we knew that oil palm is a very precocious crop, which comes into maturity at 25 months or earlier from field planting, with peak yield realized at four or more years thereafter.As early bearing and high yields in the field are mainly dependent on production of uniformly good and healthy seedlings from a nursery, it follows that good nursery management would be required to achieve the latter. The production of superior oil palm planting materials is fully dependent on attention to details at all stages in the nursery management and this entails following closely, proven standards and procedures.Oil palm has an economic productive life span of 20 years or more and any shortcomings in the planting material will have long term consequences on yield. As such, the grower must select and plant only the best in his field in order to maximize his yields.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

As a conclusion, the objectives for this study are achieved as those 3 objectives already been accomplished for each of them. To study the flow rate and head of the proposed system, as the base data already been accomplished as the study for flow rate and head of the proposed system at the proposed system. This requirement of study already been accomplished by collecting the based data from 0.5 bar, 1.0 bar, 1.5 bar, 2.0 bar until a maximum pressure at 2.5 bar for getting the average flow rate for each of the pressure and establish the graph as a based data represent for our experiment. For the second objective is to improve a method of irrigation delivery at oil palm nursery as we establish a 5 meter pipe line with a 16 dripping system and been evaluate for each one of dripping system from 1 to 16 dripping system. By applying those first and second phase of experiment, the given results show an improvement as we can knew the result can identify which pipe lines are been faced a problem for watering the plant at the oil palm nursery. For the last objective that need to achieved is to suggest a method to monitoring the irrigation delivery at oil palm nursery. Method of monitoring already been introduced as District Metering Area (DMA) as fundamentally is to screen the water distribution system and comprise in dividing. This procedure will be acquired by setting an end the valves at along specific pipe lines that interfacing one DMA to another and putting a flow meter in the remaining associating channels (open connections) that dependent on estimated inflow and outpouring of each specific pipe lines. From this investigation, it will be a great information that will be helpful for oil palm nursery that will be an great method to take care of the clogging issues. By establishing this method with study the flow rate and the based data as reference graph, then establish 2 pressure gauge and study on each of dripping system at the along of pipe line this DMA method can be establish to knowing the right condition of along path of pipe lines at the nursery mainly. As for the recommendation in this paper mainly, the experiment only focusing on which pipe line are facing a problem for dripping a water to the plant. In further research it should be able to determine which dripping system at which number or location that might have a problem rather than focusing on which pipe lines. Furthermore, for future research if those researcher can establish the data based on length on the site for oil palm nursery that more at large scale as this paper only focusing at a fundamental of knowing and established DMA at short distance at 5 meter only with 16 dripping system. Nevertheless, DMA method can be improved by establish a software that can monitor by using a such as sensor and others control system that can connect to a software at computer to improve the water delivery at oil palm nursery as we knew that oil palm an early bearing and high yields in the field are mainly dependent on production of uniformly good and healthy seedlings from a nursery.

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