جامعة القاهرة كلية الهندسة
قسم هندسة القوى الميكانيكية
معمل التحكم الأوتوماتيكى

CAIRO UNIVERSITY
FACULTY OF ENGINEERING

ACC Virtual Labs
Automatic Control Circuits & Virtual Labs for Mechanical Power Systems
معمل التحكم الأوتوماتيكى و المعامل الإفتراضية لأنظمة القوى الميكانيكية

MEP 480 B. Sc. Design Project- Year 2002/2003

4 Different Applications of Automatic Control Systems

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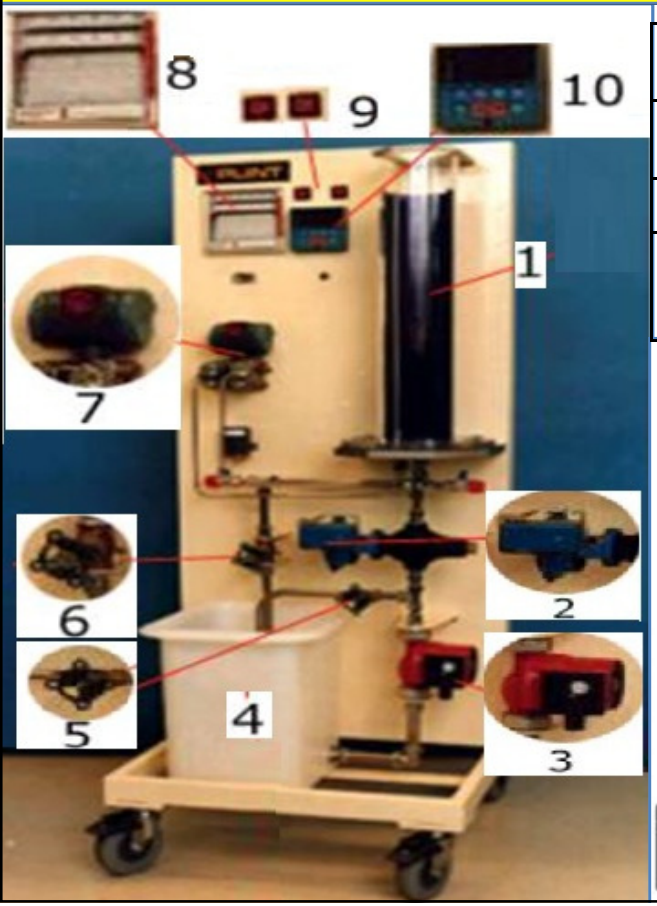
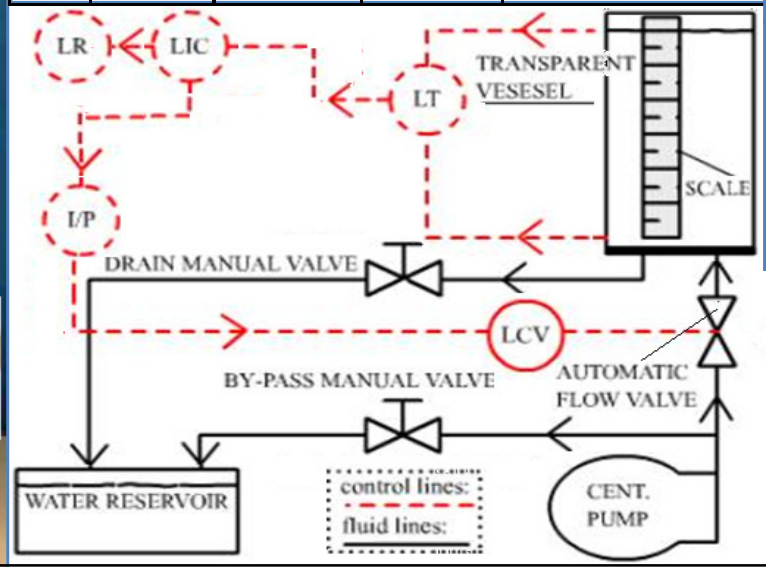
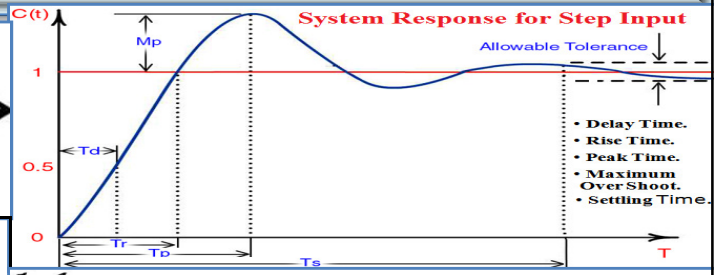
1-Investigation of Conventional Liquid Level Control Training Apparatus

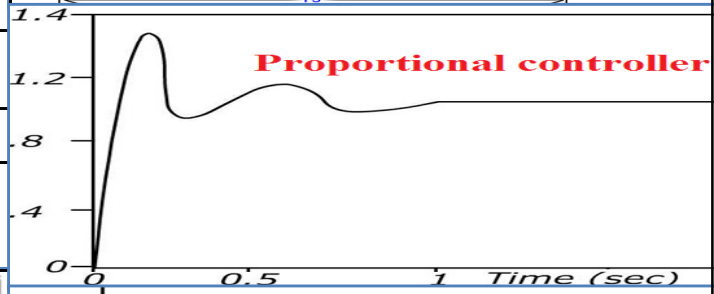


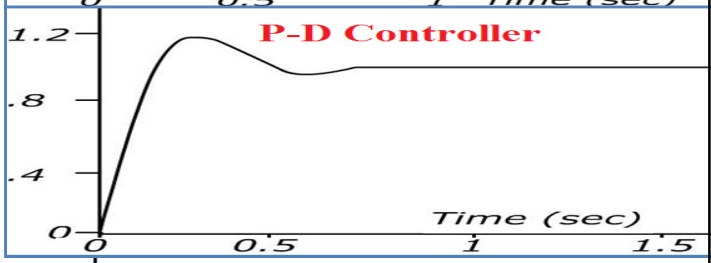
$$U = K_P E + K_I \int E dt + K_D \frac{dE}{dt}$$

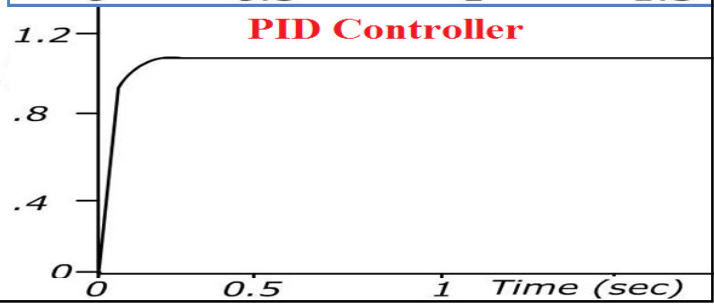
	Rise Time	Overshoot	Settling Time	S-State Error
K_P	Decrease	increase	Small changes	Decrease
K_I	Decrease	increase	increase	Eliminate
K_D	Small changes	Decrease	Decrease	Small changes



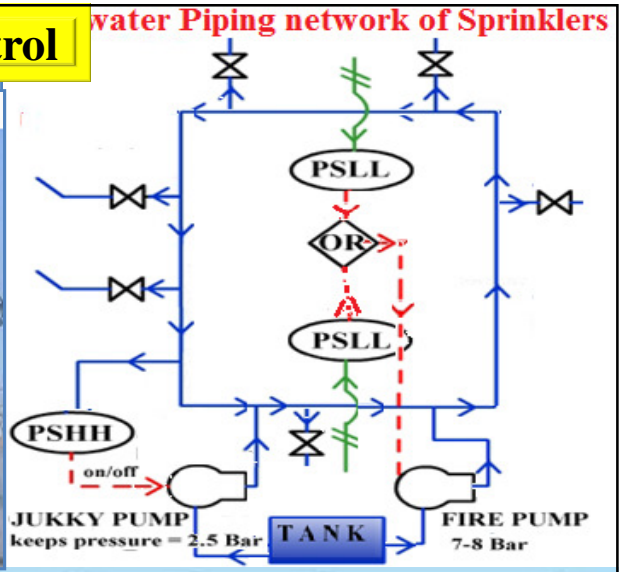


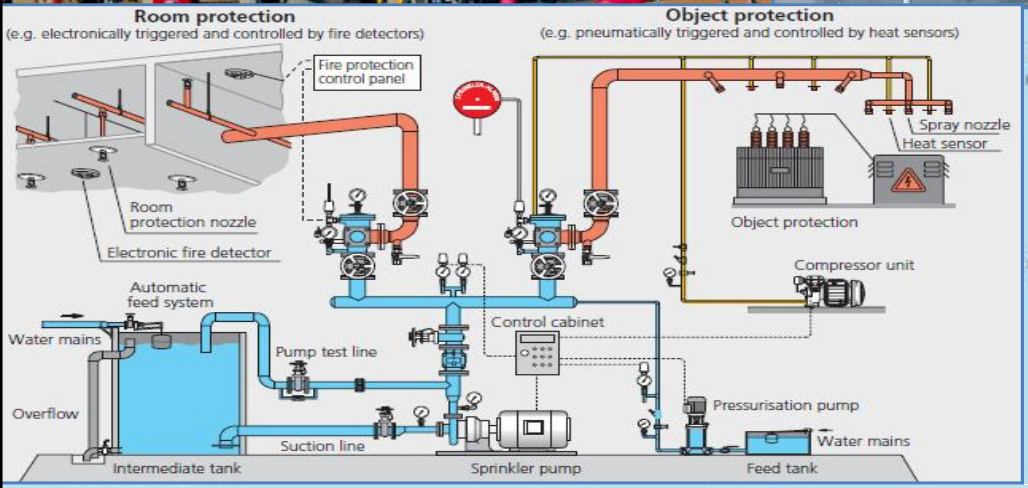


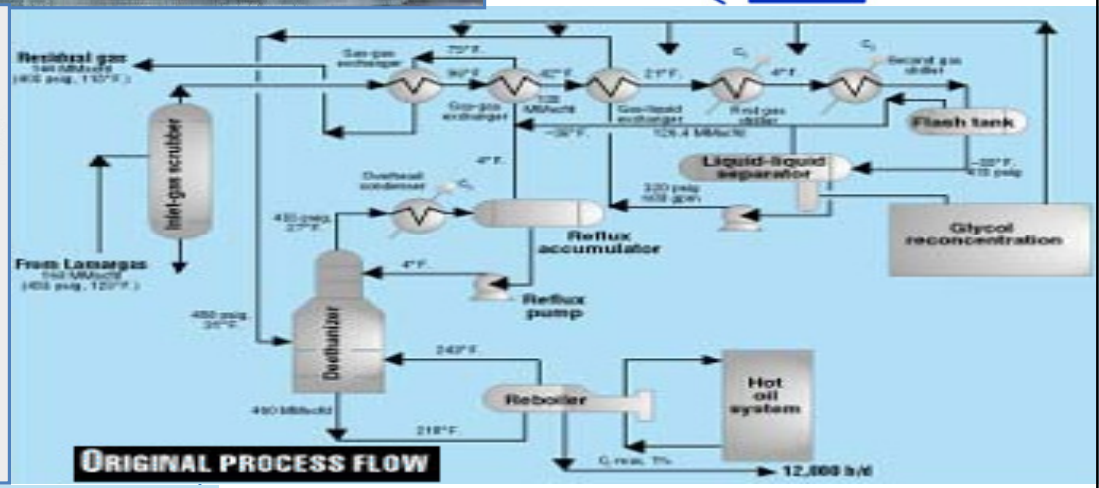


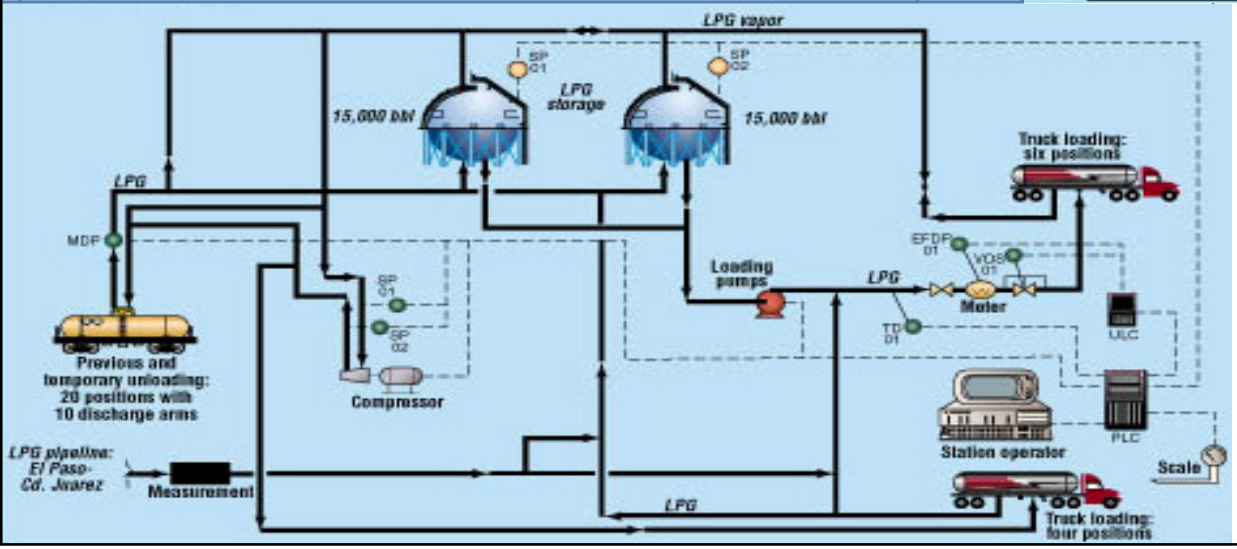


2-LPG Spheres Fire Fighting System Control









Description
These sprayers form an integral part of medium velocity watersprayers systems employed to protect plant, structures and machinery against fires which may involve highly flammable liquids, gases and solids with flashpoints of 66°C and below. They are designed to spray water over a pre-determined area in the most effective manner, in the correct quantity and at the right place.

Features
- Limits the rate of burning.
- Minimises fire damage.
- Reduces the risk of explosion.
- Assists vapour dilution and dispersion.
- Uses water as the cooling agent. AFFF maybe be introduced into the water stream if it is considered desirable to extinguish liquid hydrocarbon fires.
- Economic in the use of water.
- Compatable with other fire fighting systems i.e. dry chemical and foam can still be effectively used under the discharge.
- Stainless steel sprayers can be provided for use in corrosive atmospheres.

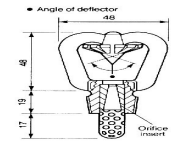
Application
Medium velocity watersprayers are designed to protect plant and structures from exposure to heat during a fire, by providing a continuous cooling waterspray over all exposed surfaces, thus preventing dangerous absorption of heat, and spread of fire.

Approval
Both copper alloy and stainless steel sprayers are approved by:
- Fire Office's Committee—UK.
- Factory Mutual and Underwriters Laboratories Inc—USA.

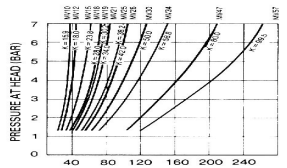
(See appropriate data sheet for details).

Specification
- Standard sprayers are manufactured from copper alloys or stainless steel.
- Shank threaded to ½ inch NPT as standard.
- The minimum working pressures of the medium velocity range of sprayers is 1.4 bar, for distance of the sprayer from its objective, density rate of discharge required. For particular applications consult Wormald Fire Systems for details.
- The sprayers are made in the range of sizes and discharge angles listed below.
- Chrome plated sprayers are also available for special installations.
- Sprayers with orifices of under 9.5mm are fitted with strainers.

DISCHARGE ANGLES
The full range of sprayers can be supplied with discharge angles of 90, 95, 110 125, 140 and 160°



FLOW CHART



NOTE: MINIMUM OPERATING PRESSURE AT NOZZLES 1.4 BAR

IDENTIFICATION
The sprayer is identified by type, bore reference and discharge angle eg. MV19-95 is a medium velocity sprayer, 7.1mm bore with 95° discharge angled deflector.

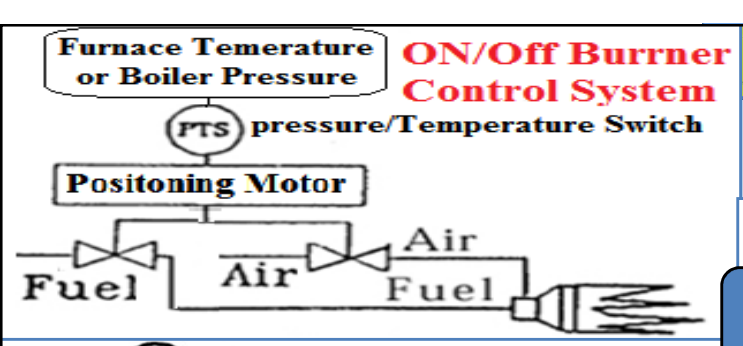
Sprayer	MV10	MV12	MV15	MV18	MV19	MV21	MV25	MV26	MV30	MV34	MV47	MV57
Nominal Bore (mm)	5.1	5.4	6.3	6.8	7.1	7.7	8.3	8.8	9.5	10.0	11.1	12.7
'K' Factor	15.9	18.0	23.8	28.0	30.2	34.0	38.2	42.0	50.0	58.8	80.0	99.5

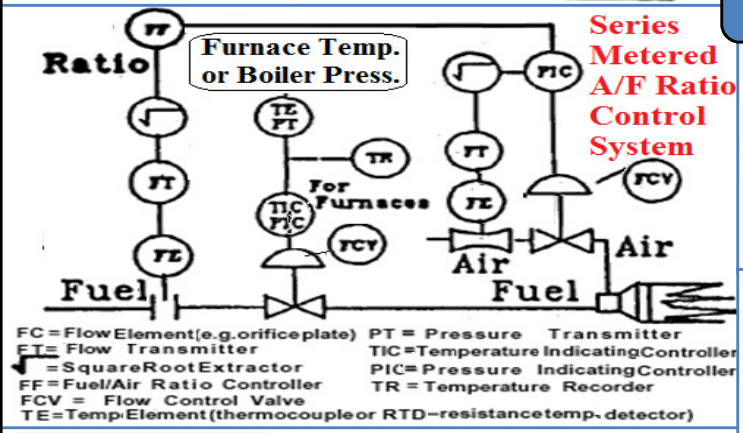
*See reverse page for discharge patterns.

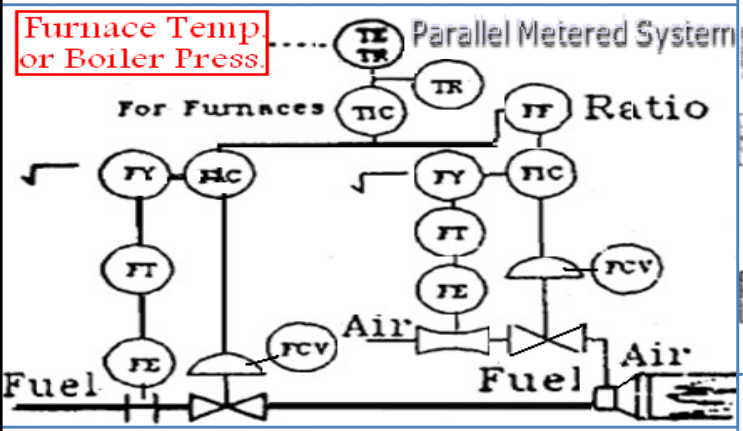
Burners

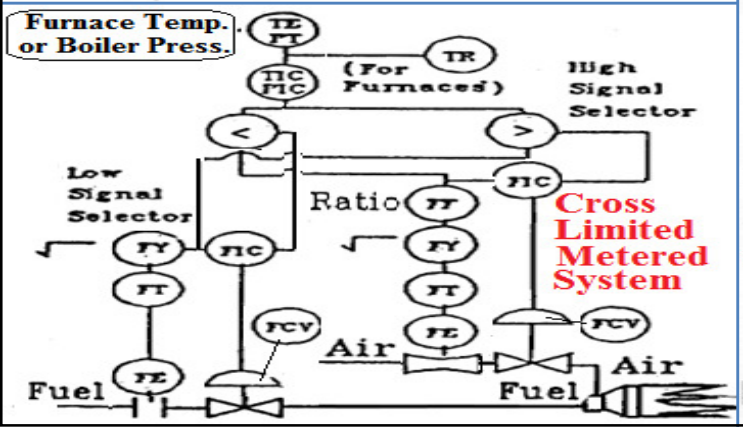
Calcination Burner

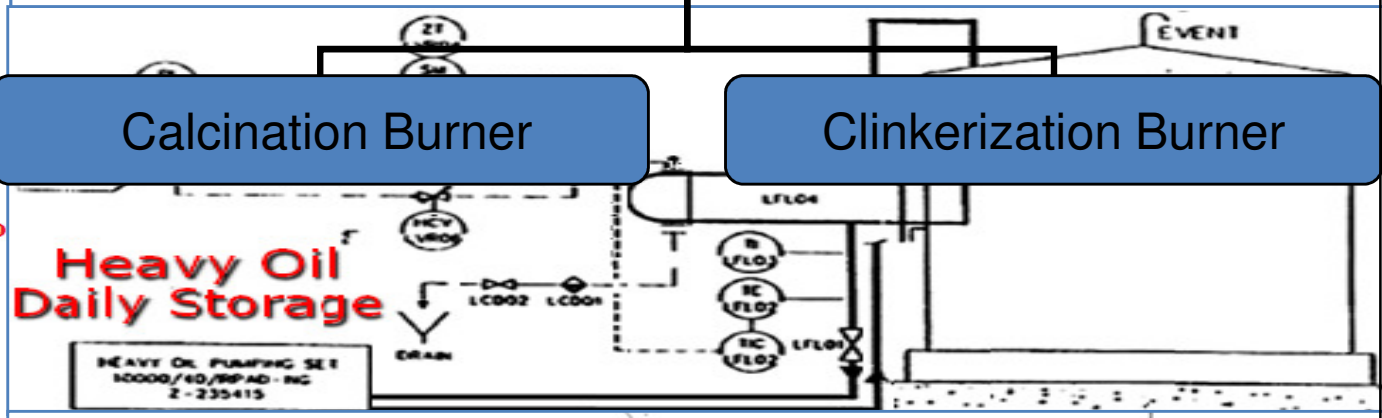
Clinkerization Burner

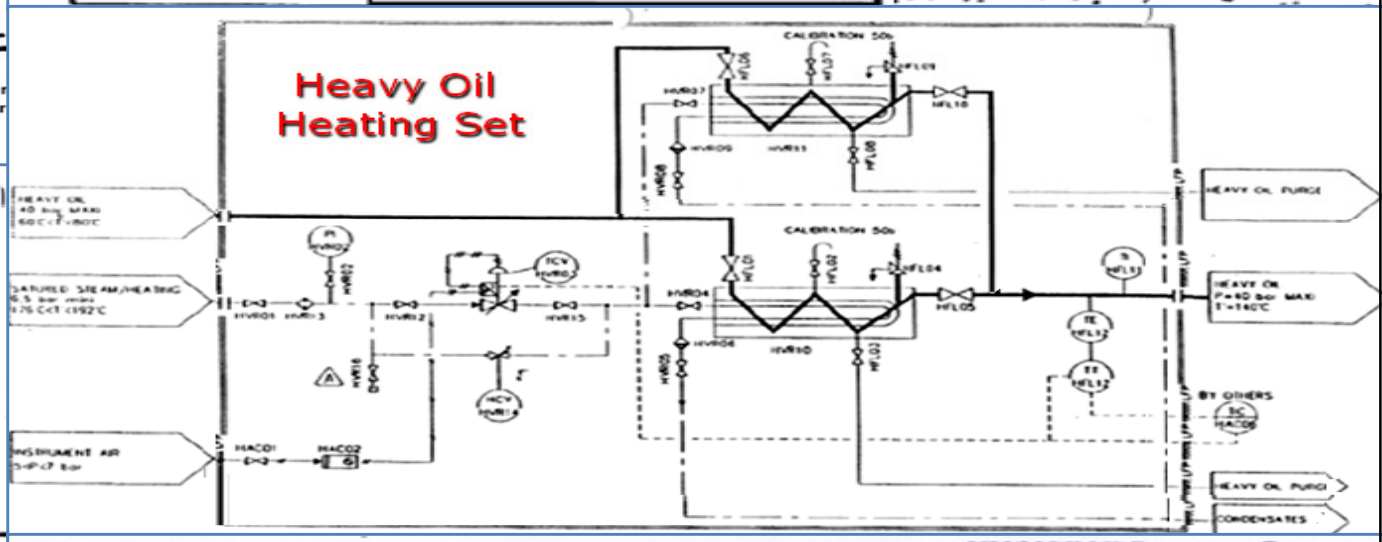


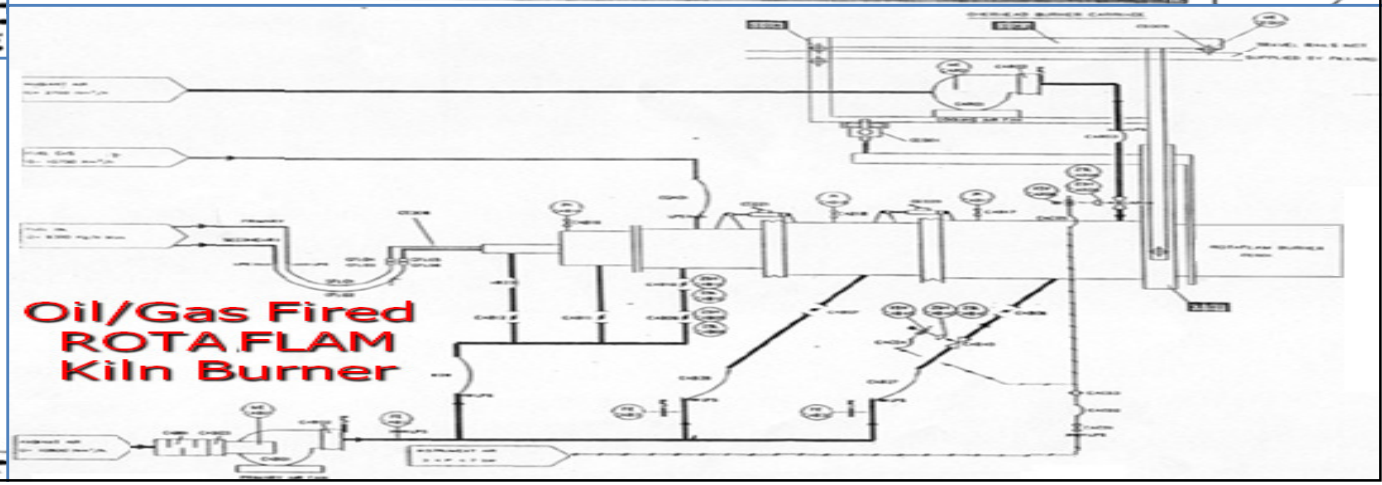




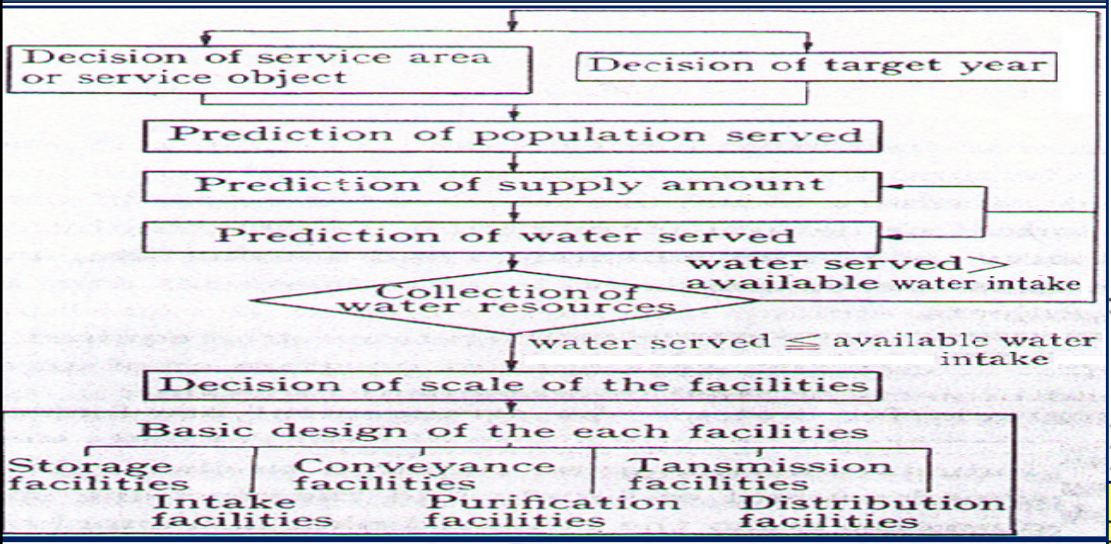


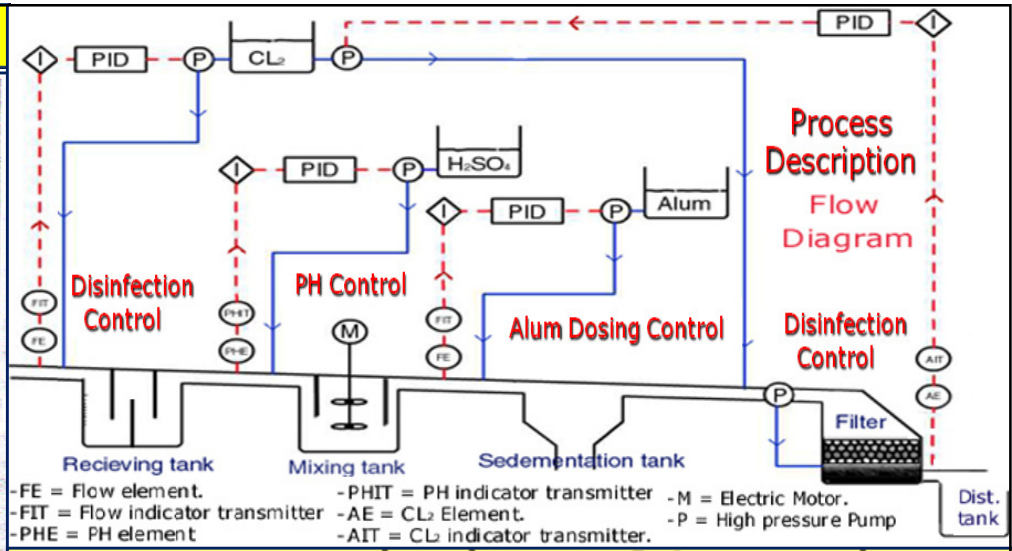




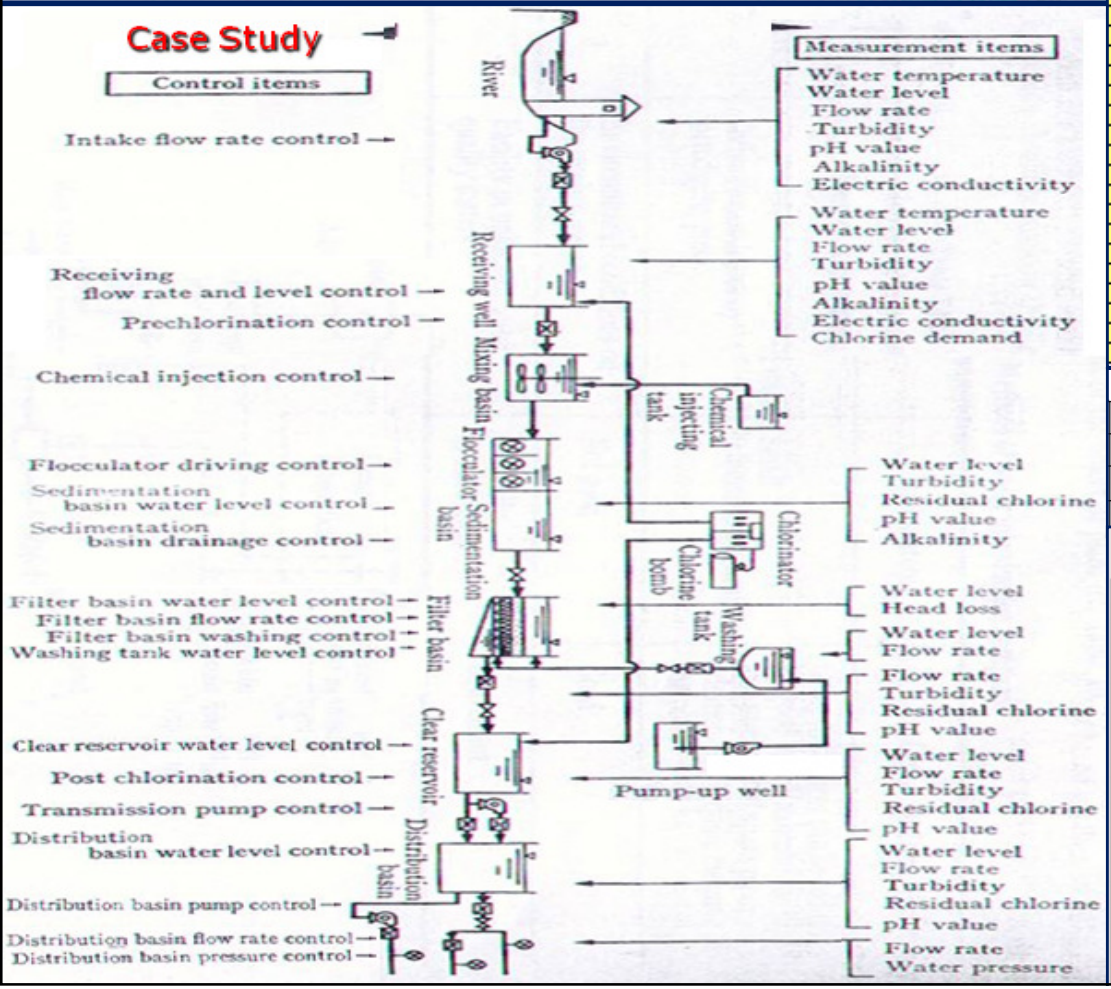


4-Water Treatment (PH & Disinfection Control)-Survey On River Nile





Parameter	Unit	Results				
		Sample 1	Sample 2	Sample 3	Sample 4	Average Results
PH		7.66	7.8	7.9	7.76	7.78
Turbidity	NTU	0.73	0.75	0.90	0.85	0.81
Conductivity	US/CM	240	236	224	265	241
Total dissolved solids	Mg/l	156	152	154	140	151
Total suspended solids	Mg/l	6	4	6	6	6
Total Alkalinity (as $CaCO_3$	Mg/l	116	114	114	118	116
Total Alkalinity (as $CaCO_3$	Mg/l	8	8	8	8	8
Total Hardness (as $CaCO_3$	Mg/l	104	104	104	100	103
Calcium Hardness (as $CaCO_3$	Mg/l	64	64	66	48	61
Magnesium Hardness (as $CaCO_3$	Mg/l	40	40	38	52	43
Iron	Mg/l	0.02	0.06	0.02	0.02	0.03
Manganese	Mg/l	NIL	NIL	NIL	NIL	NIL
Chlorides	Mg/l	11	11	11	11	11
Sulfates	Mg/l	10	11	11	10	11
Silicates	Mg/l	6.58	11.29	9.30	7.78	8.76
Phosphates	Mg/l	NIL	NIL	NIL	NIL	NIL
Ammonia	Mg/l	0.04	0.04	0.07	0.06	0.05
Nitrates	Mg/l	NIL	NIL	NIL	NIL	NIL
Nitrites	Mg/l	NIL	NIL	NIL	NIL	NIL



Natural Characteristics

Element	Maximum concentration
Colour	25 unit measured by platinum cobalt
Turbidity	5-10 unit by Jackson measured
Taste	Pass

Disinfections

- Method Of disinfections:
1) Boiling.
2) Chemical Treatment.
3) Ozone.

PH

- Scale Of PH:

pH < 7	solution is acidic
pH = 7	solution is neutral
pH > 7	solution is basic

Scale Of Formation