



جامعة الجميع الذكية
EVERYONE'S SMART UNIVERSITY

Everyone's Smart University

Project (Spring 2021)

Student Name	Abdulaziz Abdulrahman Alshamrani	اسم الطالب
Students I.D	2021200634	الرقم الجامعي

Section
Course

Master
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Code
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Advanced project Management

Instructions:

- اخر موعد للتسليم هو يوم الخميس 2021-05-~~820~~ في تمام الساعة 9 مساءً.
- الإجابة متاحة باللغة الإنجليزية أو اللغة العربية مع مراعاة أن تكون المصطلحات العلمية باللغة الانجليزية.
- يتم تسليم المشروع في صيغة ملف . pdf مع الالتزام نموذج الجامعة ولن تقبل أي مستندات أخرى.
- يجب مراعاة أقسام البحث الرئيسية (مقدمة Introduction، دراسات علمية سابقة Literature Review، طريقة البحث Methodology، النتائج والمناقشة Results and Discussion ، وأخيراً المراجع References . وان كان هناك ملحقات Appendices يتم إضافتها)
- يجب الالتزام بـ Theme موحد كما يلي:
- حجم الخط 12.
- نوع الخط Arial.
- لون الخط أسود.
- المسافة بين الأسطر 1.5 line spacing

Introduction:

This project outlines how the harvesting energy project will address current business concerns, the benefits of the project, and justification of the project. The project also discusses detailed project goals, cost benefit analysis, SOWT analysis and hydraulic for the prototype system.

Vision 2030 "The Fourth Kingdom of Saudi Arabia" has an inspiring natural prospective for renewable energy. One of them is hydroelectric energy, and its local consumption in power will be increased to three-fold by 2030. At the moment, the Kingdom of Saudi Arabia is not exploring yet all opportunities in renewable energy area. This project can contribute to the development of renewable energy in form of hydroelectric option from water transmission system. In COMPANY, The sources of hydroelectric energy from a large pipeline, of about 8' to 100' with more than 5 MCM per day of water increase the potential energy of water and the amount of generated electricity. The project aims to surpass the operating conditions of the system by reducing its power consumption. It is expected to reduce the operation cost by harvesting energy from the water transmission system and using it efficiently.

Goals and Objectives

The main objective of the project is to investigate the feasibility of incorporating energy recovery systems by using an in-line hydro turbine instead of throttle pressure by control valves in transmission systems. operating water transmission systems with minimum energy consumption, and low cost. To attain the significant purpose of this project, some specific objectives were structured to:

- Evaluate selected existing systems of water transmission, highlight their limitations, and then propose improvement schemes.
- Develop and implement the recovery devices to harvest energy.
- Evaluate the operating costs for the water transmission system.
- Study the improvement feasibility.
- implement the improvement.

Project Methodology

The objectives of the Project were achieved through the following steps:

1. Collection of required data for water transmission systems as shown in Table 2.
2. Analysis of the data based on criteria given in Figure 1.
3. Performance analysis of the hydraulic system in selected transmutation pipeline systems.
4. Selection of stable turbine based on available “head” in selected transmissions pipeline systems.
5. Calculation of the power generated from the recovery devise system.
6. Development of an economic feasibility study.

The above phases of project were completed using latest technology as well as economic specifications of the system components.

Collection of Water System Data

The required water system data are shown in the table below:

Table 1: The data of the collection of the water system

Length of Pipelines	Type of Systems	Profile of systems
Wall Thicknesses	Diameter	Flow Rates
Water Quality	Efficiency of Pumps	No. of Pumps
No. of Pumps Stations	Head of The Systems	Operations Conditions
Type of Lining	Control points and locations	Route of Pipelines

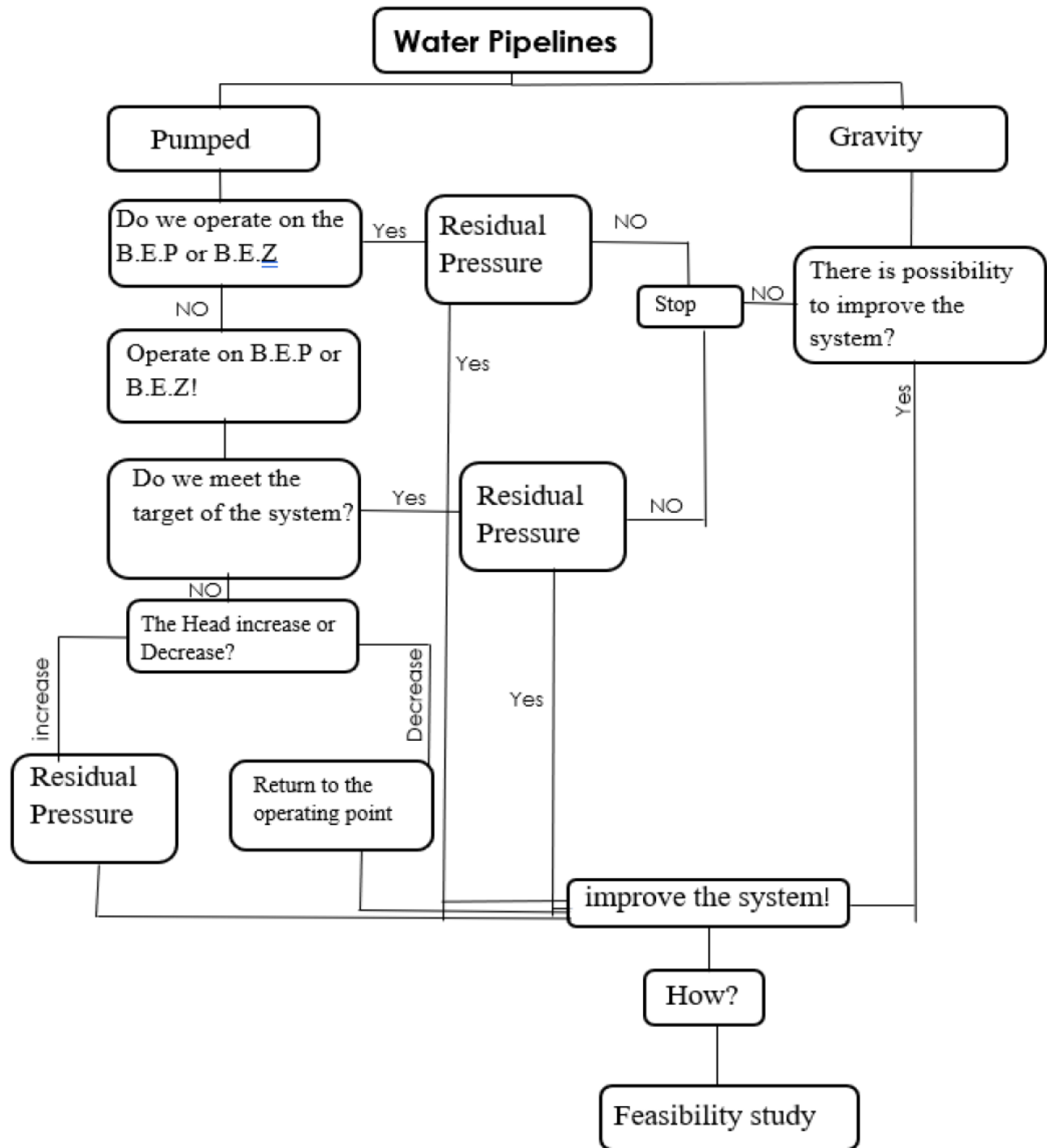


Figure 1: Flow chart for data analysis

Description of Water Transmission systems for Energy Harvesting (Prototype)

The CF2A Transmission System supplies the existing Terminal Groups with water from the existing storage area. The starting point of all CF2A will be a new outlet manifold at the reservoir area of high point. The operation for the CF2A is carried out by gravity flow. The Line CM2A with a length of approximately 50 km from HPT-AB at 700 mals to station TG-S at 630 mals with 80" and 2032 mm steel pipes and maximum design flow 482,000 m³/day. The pressure requirement at TG-S is 2 bar inlet pressure. Figure 2 shows layout of Water Transmission Systems for Energy harvesting.



Figure 2: Layout of Water Transmission Systems for Energy harvesting.

Hydraulic Analysis:

hydraulic and power analysis is applied for CF2A pipeline. According to the gathered data, the daily pattern of consumption for flow and pressure gravity system CM2A is presented in Table 3

Table 3 Reading for flow and pressure for CF2A

OUTLET STATION				INLET STATION		
	Inlet pressure (bar)	Flow(m ³ /h)	Flow(m ³ /s)	outlet pressure (bar)	Flow(m ³ /h)	Flow(m ³ /s)
Average	0.56	12431.50	3.45	4.74	12197.97	3.39
Max	0.90	15700.00	4.36	5.30	13790.00	3.83
Min	0.50	9707.00	2.70	4.00	9530.00	2.65

In the hydraulic analysis, the calculations of friction loss and maximum flow rate are considered.

Results of the hydraulic analysis for CM2A

The total head losses between the HPT reservoirs and the inlet of TG-S, showing the design flow of 5.3 m³/s, the maximum operation flow 4.36 m³/s with HPT reservoirs full and the pipe roughness.

$K_s = 0.1$ mm.

Figure 3 shows the hydraulic gradient line for CM2A with the average flow operations; any further calculation for maximum flow operations is considered.

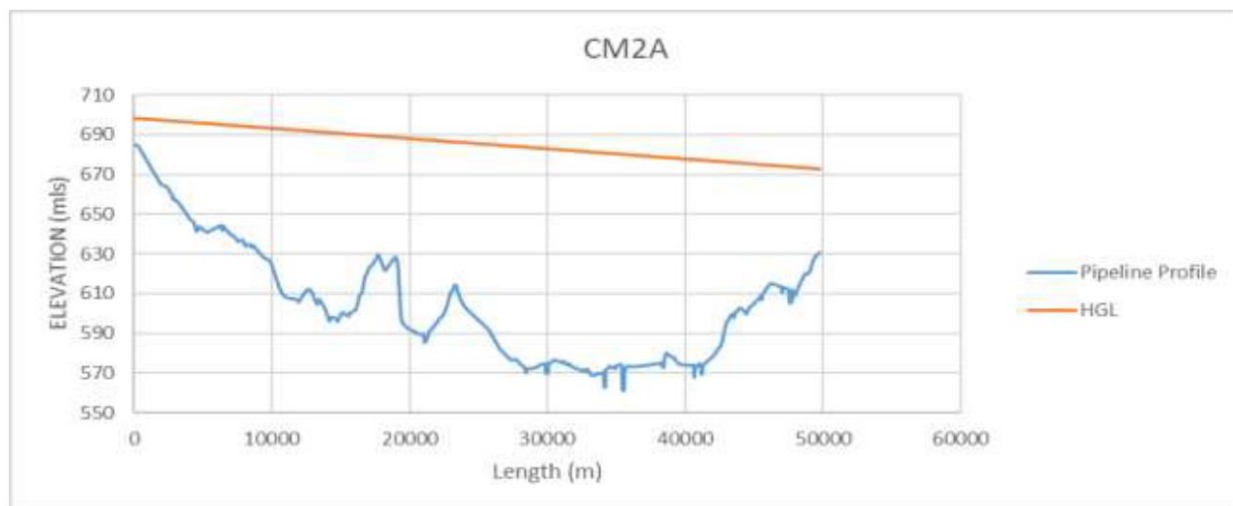


Figure 3: hydraulic gradient line for CF2A.

COST BENEFIT ANALYSIS

In this section, the Net Present Value method is used for the economic analysis and the input parameters are given in Table 4:

Table 4: Parameters for the economic analysis

Cost of power per kW	0.27 SR
inflation rate for Turbine	7.5 %
inflation rate of Power	2 %
Life Time (n)	30 Years

Summary of cost-Benefit analysis:

Flow (m3/s)	Power (KW)	OPAX (SR/Year) = 0.27 (IN-Come)	CAPX (SR)	NPV (SR) (30 Years)	Payback Period (years)
Design = 5.3 m3/s	1037	1,684,304.02	3,800,000.00	50,529,120.65	2.2
Average = 4.24 m3/s	893	1,321,814.32	3,800,000.00	39,654,429.51	2.9
Economical = 3.71 m3/s	731	1,140,569.46	3,800,000.00	34,217,083.93	3.3

Major Project Milestones

The following are the major project milestones identified at this time. As the project planning moves forward and the schedule is developed, the milestones and their target completion dates will be modified, adjusted, and finalized as necessary to establish the baseline schedule.

Milestones/Deliverables	Target Date
Project Charter	01/03/2020
Project Plan Review and Completion	01/03/2020
Gather requirement	03/03/20xx
Study Stage	04/04/20xx
Mobilization	06/06/20xx
Site Construction	08/09/20xx
Start of Supervision of Installation	11/03/20xx
Start of Commissioning	12/23/20xx
Handover	12/23/20xx

SWOT ANALYSIS

SWOT Analysis	
Strengths (Internal)	Weaknesses (Internal)
Aline with strategic plan of COMPNY	No internal software for modeling
Provide Cheap energy	Lack of data
Operate systems in high effectiveness	Funding
Environmentally Friendly	
Opportunity (External)	Threats (External)
Lead the market in Hydro-power	Cost of instrumentation
Increases profit income	Cost of operations and maintenance
Self-Power systems	Coordination for Project
Encourage research of hydro-power in Saudi Arabia	Time of procurement