

Alternative Approach of Research for Fluid Mechanics Using Multi- Disciplinary Tools

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Abstract

This paper introduces to the new methods and the concepts for the fluid mechanics projects and the analysis of the feasibility reports .This also correlates to a brief outline on the applications of the modern online tools and the techniques for successfully carrying out the projects .The modern online tools that are considered for this research includes the online calculators and the online survey tools with a focus on the practicability and applicability. This research work tries to enrich the students towards the usability of the ICT-Information and the Communication Technology tools enabling the prevention of the Time-Over-runs and the Cost-Over-runs on both the ends . The Time and the Cost are the two edges of the double edged sword.

Keywords: NSTE, DIS, SIC, NSIC, SIDO, NSIE

I. Introduction

As any project proposal is to take into consideration the following in connection with the Time and the Cost factors.

Table-1 Time – Factor Vs Cost – Factor

Sl No.	Time-Factor	Cost-Factor
1	Up	Down
2	Down	Up
3	Up	Up
4	Down	Down
5	No Change	No Change

A feasibility report is prepared to closely obtain the practicability of the project. A proper definition of the feasibility report is to obtain a proposal for the capital investment in order to obtain

and develop the facilities to provide the goods and the services for the execution of the project .The goal of any feasibility report is to obtain a good return on the investment and to find the usability of the same for the selected group of the population .The figure-1 and the table-1 explain in detail about the concept of the same.

Feasibility Report – A report prepared to judge the market,technical ,financial and social profitability . Particularly the practicality of the project is judged .

An approval for the capital investment to develop facilities to provide the goods and the services.

The Goal is to get the return on the investment and to get the population utility .

The aspects include the Preliminary aspect and Feasibility aspect.

The preliminary aspect includes the marketing , technical ,economical and financial analysis .

Fig-1 Feasibility Components

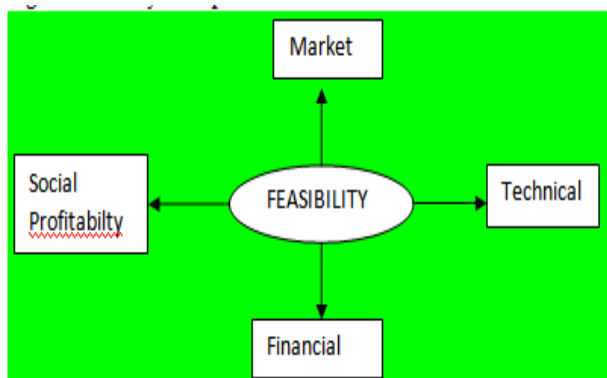


Fig-2 Aspects Analysis

ASPECTS	
Preliminary Analysis	Feasibility Analysis
Marketing ,Technical	,Economical ,Financial

Literature

Before the analysis and the consideration for the feasibility a Demand Survey is to be conducted whose basis should be on the following :

Demand Survey

Market is the place where the buyer could find the desired goods and the desired services at the suitable prices .Market is also the place where the seller could sell the desired goods and the desired services at the suitable prices .

Analysis of the past and the present ,Whether the demand is continuous or the seasonal ,Buyers opinion about the price or the quality ,
 Substitutes for the products ,Government policies ,Distribution channels ,Existing producers ,Existing consumers ,Price statistics .

The format for the project should essentially consist of the below mentioned :-

Table-3 Project Details

Sl No.	Particular(S)	Detail(S)
1	Names of the Promoters of the project	
2	Product names and the uses	
3	Raw Material Industries	
4	Sources of the supply of the raw materials	
5	The process selected	
6	The location of the plant	
7	The normal quality of the output	
8	Various Financial sources	
9	The total cost of the project	
10	Unit cost of the product	
11	Details of the market	
12	Demand for the present /past /future	
13	Distribution Methods	
14	Initial cost	
15	The cost of the Conveyance	
16	Commercial Profitability	
17	General Information	

Table-4 Project Report Requirements

Sl No.	Description	Description in Detail(S)
1	Short Description of the project	
2	History ,Development ,Need and Prospects	
3	Objectives of the report	
4	Scope of the report	
5	Characteristics of the product	Specifications ,Uses and the Quality
6	Market position /trends	Installed capacity, Present Demand, Anticipated Demand, Export problems.
7	Raw Materials	Requirements. Sources and the Properties
8	Details of the Manufacturing	Process of the manufacturing ,Selection process ,Production techniques , Production schedule
9	Plant and Machinery	
10	Land and Building	
11	Financial Implications	Fixed capital ,Working capital , Project cost , Profitability
12	Trading Practices	
13	Marketing Strategy	
14	Requirement of the staff ,labour expenses ,wages payment .etc .	
15	Cash flow statement	
16	Government policy related to the product industry	
Sl No.		

I	Introduction						
		A	Scope				
		B	Product				
		C	Process				
		D	Marketability				
		E	Location				
		F	Sources of Finance ,Repayment Schedule				
II	Scheme					Rupees (Rs.)	
		A	Land and Building				
		B	Machinery and Equipment				
		C	Testing Equipment				
		D	Fixed Investments				
				i	Cost of the Tools , Jigs & Fixtures		
				ii	Office Equipment Cost		
				iii	Electrification Charges		
				iv	Installation Charges		
				v	Packing and the Forwarding Charges		
		E	Total Non-Recurring Expenses (i+ii+iii+iv) = Rupees				
		F	Raw materials and the consumables			Rupees (Rs.)	
				i	Indigeneous		
				ii	Imported		
		G	Staff and Labour				
				i	Indirect		
				ii	No. of wages /month		
				iii	Direct		
				iv	No. of wages /month		
			Total Salaries = Rupees				
		H	Other Expenses				
					Power Charges		
					Water Charges		
					Advertisement Charges		
					Travelling Charges		
					Commission to the Agents / Distributors		
			Total Recurring Expenses(f+g+h+i) = Rupees				
		J	Working Capital for 03 Months (3*Recurring Expenses) =Rupees				
		K	Total Investment Required			Rupees (Rs.)	
					Non-Recurring Expenses		
					Working capital for 03 months		
		L	Total cost of the production				

					Total Recurring Expenses	
					Depreciation on the Machinery	
					Depreciation on the Building	
					Depreciation on the Equipment	
					Interest on the Total Investment	
					Stationery ,Postages ,etc	
					Maintenance Charges	
					Staff Welfare	
		M				
			P & L Account			
					By Sales	
					Production Cost	
					Profit/Loss	
III	Profitability for 05-10 years = Rupees					
IV	Infrastructure					
		i	Locational Advantage			
		ii	Availability		Power	
					Labour	
					Water	
					Material	
		iii	Government Policy			
					Break Even Point	
				i	Fixed Cost	
				ii	Variable Cost	
V	Names and the addresses of the Suppliers					
		i	Raw Materials			
		ii	Machinery & Equipment			
VI	Remarks					

The analysis for the same whose details should be carried out for the below mentioned :
 Market Analysis , Product Analysis ,Production Analysis , Technical Analysis ,Economical Analysis

,Financial Analysis,Input Analysis ,Material Analysis ,Management Analysis and the Plant Location Analysis . The additional information is herewith provided for further clarity .

Table-5 Analysis Requirements

Market Analysis	Product Analysis	Production Analysis	Technical Analysis	Economical Analysis
Market Area Total Market Market Share Identification of the major consumers Identification of	Selection of the product Description of the product Specifications Uses of the product	Land Capital Manufacturing process organization.	Description of the product Description of the selected manufacturing process . Production Schedule Plant Size	Existing Demand Supply Position Name of the Competitors Costs Expenses Social benefits

the existing producers . Identification of the potential consumers . Exploring the possible new markets . Distribution channels . Transportation methods . Transportation rates . Buyers opinions . New Sources . Marketing Practices .	Selection of the Machinery Selection of the Equipment Raw materials availability . Utility of the raw materials . Estimation of the product cost . Product Development Newer small products		Labour Requirements Plant Location Sources of the supply of the raw materials . Estimation of the production cost . Details of the machinery Details of the equipment Availability of the Land/Labour/ Material/Fuel/Power	Inputs
Financial Analysis	Input Analysis	Material Analysis	Management Analysis	Plant Location Analysis
Cost Estimates Sales Fixed and the Working Capital Return on the Investment Production Cost Price Balance Sheet Break even volume Cash flow and the ratio analysis Sources of the finance	Total cost of the project Investment abilities Investment through the shares and the debentures Incentives Subsidies Financial Statements , cost flow and the fund flows 7M's M-Manpower M-Material M-Machinery M-Money M-Management M-Methods M-Measurement	Quantity of the Material Time required for the procurement Type of the material Means of the conveyance Source of the supply Methods of the purchase Management Analysis Promoters capability Competence Quality of the Management Academic Qualifications Industrial Experience Business Experience	Quality of the Management Type of the Management Time of the Procurement Source of the Suppliers Methods of the Purchase Means of the Conveyance	Raw Materials Market Transportation Facilities Power Fuel Water Manpower Atmospheric Conditions Climatic Conditions Similar Industries Service Industries Service Facilities Local Taxes Government Policies

Additional Information :

******Market Analysis**

1. Probable share of the market is to obtained .
2. Transportation rates are to be obtained for the existing and the future .
3. The buyers opinion is to be obtained about the cost of the product .
4. The buyers opinion is to be obtained about the quality and the quantity of the product .
5. The sources of the information should be collected for the Domestic products as well as the International Products .

******Product Analysis**

1. The selection of the product should differentiate between the between the banned and the controlled products by the government and the experienced partners .
2. The selection should focus on the incentives and the concessions offered by the government.
3. The selection should be based upon the technical know how about the product .

4. The description of the product should be based upon the specifications of the product .
5. The description should be based upon the uses of the product .

*****Production Analysis**

1. The land includes all that are available above the surface of the land including the manpower and the services .

*****Economic Analysis**

1. This is to be carried out for the purpose of the analyzing the social profitability .

Table-6 Social profitability

1	2	3	4	5	6	7
Existing Demand	Supply position	Nature of the competition	Costs	Expenses	Social benefits	Inputs

Research Methodology

For obtaining the results in all the above mentioned, the calculators as mentioned below could be used effectively which later on could be analyzed.

Table-7 Online Tools for the Research Calculations with the Description

Sl No.	Online Calculators	Description
1	http://easycalculation.com/physics/fluid-mechanics/fluid-mechanics.php	Fluid Mechanics Calculator
2	http://easycalculation.com/basic-scientific-calculator.php	Basic Scientific Calculator
3	http://easycalculation.com/budget/budget.php	Budget Calculator
4	http://easycalculation.com/finance/finance.php	Finance Calculator
5	http://easycalculation.com/mortgage/mortgage.php	Mortgage Calculator
6	http://easycalculation.com/tax/tax.php	Tax Calculator
7	http://easycalculation.com/algebra/algebra.php	Algebra Calculator
8	http://easycalculation.com/matrix/index.php	Matrix Calculator
9	http://easycalculation.com/numbers.php	Numbers Calculator
10	http://easycalculation.com/differentiation/differentiation-calculator.php	Differentiation Calculator
11	http://easycalculation.com/integration/integration.php	Integration Calculator
12	http://easycalculation.com/date-day/dates.php	Date and Day Calculator
13	http://easycalculation.com/event/event-calendar.php	Event Calculator
14	http://easycalculation.com/charts/chart.php	Charts Online
15	http://easycalculation.com/graphs/graph.php	Graphs Online
16	http://easycalculation.com/colorconverter/rgb-coder.php	Colour Converter
17	http://easycalculation.com/hexa-decimal-binary.php	Hexa,Decimal,Binary Converter
18	http://easycalculation.com/unit-conversion/index.php	Units Converters
19	http://easycalculation.com/currency-converter/index.php	Currency Converters
20	http://easycalculation.com/analytical/analytical.php	Analytical Geometry
21	http://easycalculation.com/area/maths.php	Areas Calculators
22	http://easycalculation.com/trigonometry/trig.php	Trigonometry Calculator
23	http://easycalculation.com/health/health.php	Health Calculators
24	http://easycalculation.com/medical/medical.php	Medical Calculator
25	http://easycalculation.com/weather/weather.php	Weather Calculator
26	http://easycalculation.com/bandwidth-calculator.php	Bandwidth Calculator
27	http://easycalculation.com/chemistry/chemistry.php	Chemistry Calculator
28	http://easycalculation.com/engineering/civil/civil.php	Civil Engg Calculator
29	http://easycalculation.com/engineering/marine/marine.php	Marine Engg Calculator
30	http://easycalculation.com/engineering/mechanical/mechanical.php	Mechanical Engg Calculator
31	http://easycalculation.com/engineering/electrical/electrical.php	Electrical Engg Calculator
32	http://easycalculation.com/operations-research/index.php	Operations Research Calculator
33	http://easycalculation.com/physics/physics.php	Physics Calculator
34	http://easycalculation.com/theorems/geometry-theorems.php	Mathematical Geometry Theorems
35	http://easycalculation.com/tutorial.php	Tutorial
36	http://easycalculation.com/calculator-download.php	Download
37	http://easycalculation.com/puzzles/puzzle.php	Puzzles
38	http://easycalculation.com/usercalci/build-calculator.php	Java Script & HTML

		Calculators for the Websites
39	http://hscripts.com/	Free Webmaster Resources

All the above mentioned calculators are just shown as an example for the usage for the feasibility calculations. The research methodology is to involve the use of the online tools namely online calculators and the online survey tools which could be effectively used for the progressive purposes .

Table-8 Online Tools for the Survey Research with the Description

Sl No.	Online Survey Tools	Description
1	http://www.esurveyspro.com/Remember.aspx	To conduct the online survey in order to obtain the ideas and conclusions .
2	http://www.pocketsurvey.net/?gclid=CMGUI7Ca1rUCFYEn4godVDcAsA	To conduct the survey from any location .
3	https://www.surveymonkey.com/	To conduct the surveys .
4	http://www.survs.com/?utm_source=google&utm_medium=cpc&utm_content=aw1-c4-ag1&utm_campaign=aw1-c4&gclid=CONI9qbdpLsCFW964god0A4ASA	To create online surveys .

Sample Calculation (<http://easycalculation.com/physics/fluid-mechanics/fluid-mechanics.php>)

Calculator Options provided (104 Nos.)–

- | | |
|--|--|
| 1. Specific Gravity with Water Weight | 41. Plastic Pipe - Outside Diameter Controlled Short Term Strength |
| 2. Rectangular Weir | 42. Smooth Wall Steel Pipe - Pressure Rating |
| 3. Specific Gravity with Water Weight Loss | 43. Specific Gas Constant |
| 4. Bernoulli Theorem for Head Loss | 44. Specific Volume |
| 5. Flow Rate | 45. Thrust Block |
| 6. Darcy Weisbach - Head Loss | 46. Unconfined Aquifer Well Flow Rate |
| 7. Fluid Pressure | 47. Unrestrained Pipe Length Change |
| 8. Absolute Pressure | 48. Restrained Anchored Pipe Stress |
| 9. Bulk Modulus | 49. Water Hammer - Maximum Surge Pressure Head |
| 10. Compressibility Calculator | 50. Water Hammer - Maximum Surge Pressure for a Fluid |
| 11. Fluid Density with Pressure | 51. Water Hammer - Maximum Surge Pressure for Water |
| 12. Hazen Williams - Mean Fluid Velocity | 52. Water Hammer - Pressure Increase |
| 13. Hazen Williams - Fluid Flow Rate | 53. Acoustic Flowmeter |
| 14. Manning Flow Velocity | 54. Curb Gutter Flow Rate |
| 15. Minor Losses | 55. Curb Capture Flow Rate |
| 16. Water Horsepower | 56. Gutter Interception Capacity |
| 17. Brake Horsepower | 57. Slotted Pipe Gutter Interception |
| 18. Pump Efficiency | 58. Gutter Capture Efficiency |
| 19. Net Positive Suction Head and Cavitation | 59. Gutter Carryover |
| 20. Stokes Law | 60. Reynolds Number |
| 21. Venturi Meter for Flow Rate | 61. Cauchy Number |
| 22. Aluminum Pipe - Pressure Rating | 62. Cavitation Number |
| 23. Buried Corrugated Metal Pipe Thrust - Pressure | 63. Eckert Number |
| 24. Buried Corrugated Metal Pipe Thrust - Pipe Wall | 64. Euler Number |
| 25. Buried Corrugated Metal Pipe Thrust - Cross Sectional Area | 65. Froude Number |
| 26. Chezy Velocity | 66. Knudsen Number |
| 27. Chezy Coefficient | 67. Lewis Number |
| 28. Darcys Law - Flow Rate | 68. Mach Number |
| 29. Darcys Law - Hydraulic Gradient | 69. Nusselt Number |
| 30. Darcys Law - Seepage Velocity | 70. Peclet Number |
| 31. Darcys Law - Flux | 71. Prandtl Number |
| 32. Darcys Law - Seepage Velocity and Porosity | 71. Schmidt Number |

- 33.Darcys Law - Void Ratio
- 34.Darcys Law - Porosity
- 35.Darcys Law - Saturated Soil
- 36.Ductile Iron Pipe - Wall Thickness
- 37.Ductile Iron Pipe - Pressure
- 38.French Drain Seepage Rate
- 39.Hydraulic Radius
- 40.Mean Depth
- 79.Orifice Flow Rate
- 80.Parshall Flume Flow Rate
- 81.Permeameter Porous Medium Flow Rate
- 82.External Hydrostatic Pressure
- 83.Pipe Soil Weight Pressure
- 84.Pipe Water Buoyancy Factor
- 85.Euler Numbers
- 86.Soil Load Per Linear Length Of Pipe
- 87.Pipe Vacuum Pressure Load
- 88.Plastic Pipe - Outside Diameter Controlled
- 89.Plastic Pipe - Inside Diameter Controlled
- 90.Plastic Pipe - AWWA C900 Pressure Class
- 91.Plastic Pipe - Short Term Pressure Rating Speed Calculator
- 92.Proportional Navigation Calculator

- 72.Sherwood Number
- 73.Threshold Odor Number
- 74.Weber Number
- 75.Fourier Number
- 76.Brittle calculator
- 77.Strohaul Number
- 78.Kinematic viscosity
- 93.Liquid phase diffusion coefficient
- 94.Poiseuille equation
- 95. V notch weir
- 96.Rectangular weir discharge
- 97.Bernoulli numbers
- 98.Bazins weir flow
- 99.Buoyancy Force Calculator
- 100.Engine HP Horsepower Change Calculator - ET Method
- 101..Engine Horsepower Calculator Using ET Method
- 102.Engine Horsepower Calculator
- 103.Engine HP Horsepower Change Calculator - Trap Speed Method
- 104.Vehicles Horse Power to Weight Ratio Calculator

Let us consider an example of calculating the Head Loss using the Bernoulli's Equation :

*****Conventional Methodology**

Bernoulli Theorem for Head Loss:

Bernoulli Theorem for Head Loss:

$$h_L = z_1 - z_2 + \frac{P_1 - P_2}{\rho g} + \frac{V_1 - V_2}{2g}$$

where, h_L = Head Loss, Z_1 = Static Head or

Elevation at Point 1, Z_2 = Static Head or Elevation at Point 2, P_1 = Pressure at Point 1, P_2 = Pressure at Point 2, V_1 = Velocity at Point 1, V_2 = Velocity at Point 2, ρ = Density, g = Acceleration of Gravity.

*****Advanced Methodology**

1. Before the Data Entry

Static Head or Elevation(Z_1) =	<input style="width: 100%;" type="text"/>	m
Static Head or Elevation(Z_2) =	<input style="width: 100%;" type="text"/>	m
Pressure(P_1) =	<input style="width: 100%;" type="text"/>	P
Pressure(P_2) =	<input style="width: 100%;" type="text"/>	P
Velocity(V_1) =	<input style="width: 100%;" type="text"/>	m/s
Velocity(V_2) =	<input style="width: 100%;" type="text"/>	m/s
Density(ρ) =	<input style="width: 100%;" type="text"/>	kg/m ³
Acceleration of Gravity(g) =	<input style="width: 100%;" type="text"/>	m/s ²
Results:		
Head Loss(h_L) =	<input style="width: 100%;" type="text"/>	m

2. After the Data Entry

Static Head or Elevation(Z_1) =	<input type="text" value="25"/>	m
Static Head or Elevation(Z_2) =	<input type="text" value="50"/>	m
Pressure(P_1) =	<input type="text" value="1500"/>	P
Pressure(P_2) =	<input type="text" value="3000"/>	P
Velocity(V_1) =	<input type="text" value="2500"/>	m/s
Velocity(V_2) =	<input type="text" value="3500"/>	m/s
Density(ρ) =	<input type="text" value="1.5"/>	kg/m ³
Acceleration of Gravity(g) =	<input type="text" value="9.8"/>	m/s ²

Results:

Head Loss(h_L) = m

3. Result(S) Generation

Results:

Head Loss(h_L) = m

Comparison between the Conventional Methodology and Advanced Methodology

POD	Conventional Methodology	POD	Advanced Methodology
1	Lengthy Calculations are required .	1	No Lengthy Calculations are required .
2	Time Consuming .	2	Less Time Consuming .
3	Need for the Paper Work .	3	No Paper Work at all .
4	Not suitable to do the work at any time .	4	Suitable to do the work at any time .
5	No mobile phone usage .	5	Could be calculated with the mobile phones also when provided with the internet facility .

II. Discussions

All the above mentioned would be very helpful in fixing up the time and the cost overruns as the same could be very well linked up with the

III. Future Work

http://www.adciv.org/Examples_of_free_and_open-source_software
<http://www.pocketsurvey.net/?gclid=CMGUI7Ca1rUCFYEn4godVDcAsA>
<http://www.quantitativeskills.com/sisa/>
<http://www.engineersedge.com/calculators.htm>

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