

# Generalized Data base Model for Solvent Extraction Plant to Improve Productivity: 2019

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**Abstract:** *It has been observed in G. S. Oil, Rampur Road, Light Industrial Area, Adilabad, Andhrapardesh, India [2000], Murli Agro Solvent Extraction Plant, M.I.D.C., Hingna Road, Nagpur, M. S., India. [2002] , & Jaiswal Nagpur Engineering Company Wadoda, Dist. Nagpur, M. S., India. [2004] that most of the worker are doing work from morning to evening but production rate of oil very low. Same way visited in lot of solvent plant over in the India, Whereas Mahdyia pradesh Pithampur, Devas, Indor, Selam in Kerala, North America, Africa, Netherland, Sauth Koria, Australiya, China & Kanada are very pathetic condition. Number of research paper read out over the solvent plant and decide to do the work over this topic.*

**Introduction:** Today the urbanization very tremendously increasing on. In This Era Oil Production rate more require. For the development purpose need of productivity improvement to increase the production rate. Sweet oil is very basic component in food industry. Therefore to developed system to improve the production rate by applying some advanced technique like, die extension / design method, Plant layout improvement, maintenance system, chart display system, time management technique, quality control process, ergonomics system. The costing of plant in car-ores of rupees. For manual machine used in ancient days, but now fully automated plant used. Mostly plant erection technocrats available in kerla, India. Is in Nagpur city near about 2-3 solvent plant available now.

**Keywords:** Solvent Plant, Oil, Deoxidizing cake, Hexane.

**Name of Industry:** G. S. Oil, Industries, Rampur Road, Light Industrial Area, Adilabad, Telangana (Andhrapreadesh), India.

**Object:** Solvent Extraction Plant, Refinery Division, Productivity, Mathematical Model.

**Literature Survey:** Personally survey in 2000, april month & discuss with owner why the production system weak. The steel plant productivity improvement purposes used some new technique through mathematical model discuss in [14]. With taking this reference author work over same title. After long discussion it had been observed that there is the plant layout problems, oil flows in deoxydizing cake problem, maintenance schedule & quality control problem. Before that survey in 2000 same problems face in Devas, Indor plant, India & other countries. As given in [1], [2] & [3] the practically background of solvent plant. In [10], [11] & [12] discuss the regarding productivity & plant layout development. Therefore taking this research project for solution finding out. Some of solvent plant are available at Panchgaon, Umred Road, Dist. Nagpur. Again facing such problems. Some of part of industrial development case discuss in SWOT Analysis [15].

**Objectives:** 1] Improvement economizer system, Thermal system.

2] Plant Layout improvement.

3] Maintenance schedule prepare.

- 4] Chart display system.
- 5] Time management Technique.
- 6] Apply Method study.
- 7] Ergonomic Principal
- 8] Making oil extraction.

### Terminology :

Saylow- The huge capacity of soyabean seed filled in say lo.

Extractor : Depending upon capacity of plant. Drawing of extractor in rectangular shape.

No. of small capacity of motors: To flow the oil from extractor.

Compressor : Pressure range.

Trolley : doc bag shifting.

### Flow chart Oil Production :

— Saylow, soybean seed storage

-- Cooking zone

— Flaker

— Transfer flap to extractor through conveyer belt.

-- Flow through hopper in extractor

— Extract oil by spraying hexane on flaps.

-- Mixed oil Ready containing hexane & soyabean oil.

-- New mixed oil heat up up to 100 degree Celsius & due to vaporised hexane get collect by applying condenser media. Again oil heat up up to filter purpose 2 to 3 times

- Collect lower refined oil.

**Independent parameter :** Deoxidizer, area of land, Shape of extractor, Market demand, Customer satisfaction, Manpower variation.

**Dependent variable :** Hexane, Soyabean seed.

### Mathematical Model:

Production rate in a day = Capacity of machine + Manpower utilizing & other factors

**Formulation:** For finding the output of industry[27]

$$Y = K [ A^a \times B^b \times C^c \times D^d \times E^e \times F^f \times G^g \times H^h \times I^i \times J^j ] \text{-----equ.[1]}$$

Taking log both sides

$$\log Y = \log K [ a \log A \times b \log B \times c \log C \times d \log D \times e \log E \times f \log F \times g \log G \times h \log H \times i \log I \times j \log J ] \text{-----equ.[2]}$$

Y (Output of Production)

K= Propornationality Constant

N = Name of Solvent Plant

P = G. S. Oil, Adilabad, Andhrapardesh, India,

P = Murli Agro. Solvent Plant, Hingna, Nagpur

P = Jaiswal Nagpur Engineering Company Wadoda, Dist. Nagpur,

P = Solvent Extraction Plant, Selam, Kerala.India

Wt. A + Wt. B + Wt. C + Wt. D + Wt. E + Wt. F + Wt. G + Wt. H+Wt. I+Wt. J = are respective raw material waightage w. r. t. plant owener assinged the qualitative quantity.

Therefore: P + P + P + P =1

A, B, C, D, E, F, G, H, I, J = Are the variables of plant need. Like processing material, Electricity, Manpower, Finance, Water, Transportation Facility, Land, Machinery, Maintenance system.

a,b,c,d,e,f,g,h,i,j are respective indices of plant need.

In table 1 shows the constant & Movable variables with classification.

Solvent Extraction Plant Model					
S. N.	Constant Variables	Movable Variables		Classification of Movable Variables	
Variables:1	Oprator[A]	Education	A <sub>1</sub>	Technical	Non- Technical
		Age	A <sub>2</sub>	20-30	30-58
		Place	A <sub>3</sub>	Native	Transferable
		Wages	A <sub>4</sub>	High	Medium
		Experience	A <sub>5</sub>	Higher	Lower
		Maintality	A <sub>6</sub>	Sound	Normal
		Family Background	A <sub>7</sub>	Industrial Oriented	Non- industrial
		Intellectual Capability	A <sub>8</sub>	High	LOW
		Add-on Program attd.	A <sub>9</sub>	High Number	Low Number
		Software awareness	A <sub>10</sub>	Modern software	Normal software

		Vehicle using	A <sub>11</sub>	Own	Industrial vehicle
		Higher study deserving	A <sub>12</sub>	Part time	Study leave
		Categories of operator	A <sub>13</sub>	Permanent	Contract
Variables:2	Location [B]	Working Capability	A <sub>14</sub>	Hardcore	Software
		Operator Availability	A <sub>15</sub>	Mass Quantity	Limited
		Hill area	B <sub>1</sub>	High hill	Lower hill
		Distance from city	B <sub>2</sub>	Nearby	Not possible to operator up-down
		Quality of Land	B <sub>3</sub>	Dry	Stone oriented
		Facility	B <sub>4</sub>	Gardening	Robust area
		Water facility	B <sub>5</sub>	Ample	Only working
Variables:3	Transport [C]	Land ownership	B <sub>6</sub>	lease	own purchased
		Raw material & final goods	C <sub>1</sub>	Road	Rail
Variables:4	Working Environment [D]	By Trucks	C <sub>2</sub>	Logistic	Daily/ Weekly/ Monthly
		Ergonomics	D <sub>1</sub>	Light system	Colour light system
		Seating arrangement	D <sub>2</sub>	Suitable m/c operating oriented chair	Abedent
		Air system	D <sub>3</sub>	Air conditioning	Normal
		Suitable to body	D <sub>4</sub>	Healthy	Tidious
Variable:5	Electrification [E]	Power Consumption	E <sub>1</sub>	Heavy	Normal
		Current Flowing Capability	E <sub>2</sub>	A/C	D/C
Variable:6	Finance [F]	Money Mode	F <sub>1</sub>	Bank	Own Finance
		From Market Collection	F <sub>2</sub>	Share	Bond
Variable:7	Machine [G]	CNC M/c	G <sub>1</sub>	Automatic	Semi- automatic
		M/C Orientation	G <sub>2</sub>	Traditional	Unconventional
Variable:8	Innovation [H]	Place of invention	H <sub>1</sub>	Institute Invention	Industrial Invention
		Invention	H <sub>2</sub>	Industry Incubation	Business Incubation
		Idea	H <sub>3</sub>	New idea	Research Idea
		Enhancement Level	H <sub>4</sub>	Corporation level	Institute level

		Opinion invention	H <sub>5</sub>	Interactive invention	Experimental invention
		Categories of invention	H <sub>6</sub>	Number of idea	Complete Invention
Variable:9	Marketing [I]	Spread in Market	I <sub>1</sub>	Order base	Door to Door
			I	Mass Quantity	Retailor
			I	Digital	Communication
Variable:10	Feedback [J]	Inventional Product	J	Individual	Group
			J	Product Improved	Product Rejected
			J	Product Limited Demand	Product Heavy Demand

**Table:1 Constant & Movable variables of solvent extraction plant**

Following equ. put in equ. [i] to [x] put in equ.[1]

$$A=A_1^a, A_2^a, A_3^a, A_4^a, A_5^a, A_6^a, A_7^a, A_8^a, A_9^a, A_{10}^a, A_{11}^a, A_{12}^a, A_{13}^a, A_{14}^a, A_{15}^a \text{ -----equ.[i]}$$

$$B=B_1^b, B_2^b, B_3^b, B_4^b, B_5^b, B_6^b \text{ -----equ.[ii]}$$

$$C=C_1^c, C_2^c \text{ -----equ.[iii]}$$

$$D=D_1^d, D_2^d, D_3^d, D_4^d \text{ -----equ.[iv]}$$

$$E=E_1^e, E_2^e \text{ -----equ.[v]}$$

$$F=F_1^f, F_2^f \text{ -----equ.[vi]}$$

$$G=G_1^g, G_2^g \text{ -----equ.[vii]}$$

$$H=H_1^h, H_2^h, H_3^h, H_4^h, H_5^h, H_6^h \text{ -----equ.[viii]}$$

$$I=I_1^i, I_2^i, I_3^i \text{ -----equ.[ix]}$$

$$J=J_1^j, J_2^j, J_3^j \text{ -----equ.[x]}$$

$$Y= K [ (A_1^a, A_2^a, A_3^a, A_4^a, A_5^a, A_6^a, A_7^a, A_8^a, A_9^a, A_{10}^a, A_{11}^a, A_{12}^a, A_{13}^a, A_{14}^a, A_{15}^a ) \quad \mathbf{X} \quad ( B_1^b, B_2^b, B_3^b, B_4^b, B_5^b, B_6^b ) \quad \mathbf{X} \quad ( C_1^c, C_2^c ) \quad \mathbf{X} \quad ( D_1^d, D_2^d, D_3^d, D_4^d ) \quad \mathbf{X} \quad ( E_1^e, E_2^e ) \quad \mathbf{X} \quad ( F_1^f, F_2^f ) \quad \mathbf{X} \quad ( G_1^g, G_2^g ) \quad \mathbf{X} \quad ( H_1^h, H_2^h, H_3^h, H_4^h, H_5^h, H_6^h ) \quad \mathbf{X} \quad ( I_1^i, I_2^i, I_3^i ) \quad \mathbf{X} \quad ( J_1^j, J_2^j, J_3^j ) ] = 1 \text{ -----equ.[3]}$$

**Plant Machine :** i) Air Compressor System Die, considering different stresses.

ii) As per requirement die size can change. [The base of marketing.]

iii) The depending upon air compressor pressure.

iv) Design of transportation trolley. How many no. of bag loaded over the tray.

- v) The design of extractor. With considering shearing forces.
- vi) Depending upon the availability of land, finance & manpower.
- Vii) Design of mixer.

**Expected outcome :**1] Produce oil loss save, which is flow in DOC.

- 2] Utilization of space very exactly.
- 3] Less maintenance of machine, oil compressor & mixer.
- 4] Plant instruction display on notice board for safety from any accident.
- 5] Work measurement / time management very essential to improve production rate output.
- 6] Display process chart, to easily any operator perform the assigned task.

**Data collection :1**

S.N.	Data	Numerical values	Units
1	Plant size	5-6	Acer of land
2	Set up valuation	1-2	Carer Rupees
3	Economizer	30	Feet height.
4	Extractor	20-22	Mtr.
5	Deoxidizer chamber	10	Mtr.
6	Production Type	Daily	Continuous
7	Soyabean seed	25000 bag per day	100Kg. each bag
8	Capacity of Plant	250per day	ton
9	Refinary	1	1unit
10	D.O.C.	17% oil extract from seed & rest of the d.o.c.[deoxydising cake]	Per day
11	Hexane	5-6	Liter

**Table: 2 G. S. Oil solvent extraction plant, Adilabad, Andhra Pradesh [ Telanga, India]**

**Data collection: 2**

S.N.	Data	Numerical values	Units
1	Plant size	7-8	Acers of land
2	Set up valuation	2-3	Carer Rupees
3	Economizer	40	Feet height.
4	Extractor	25-28	Mtr.
5	Deoxidizer chamber	12	Mtr.

6	Production Type	Daily	Continuous
7	Soyabean seed	28000 bag per day	100Kg. each bag
8	Capacity of Plant	275per day	ton
9	Refinary	1	lunit
10	D.O.C.	17% oil extract from seed & rest of the d.o.c.[deoxydising cake]	Per day
11	Hexane	7-8	Liter

**Table:3 Murli Agro solvent extraction plant, Hingna, Nagpur, M. S, India.**

**Data collection :3**

S.N.	Data	Numerical values	Units
1	Plant size	10-12	Acres of land
2	Set up valuation	5-5.5	Carer Rupees
3	Economizer	50	Feet height.
4	Extractor	30-32	Mtr.
5	Deoxidizer chamber	15	Mtr.
6	Production Type	Daily	Continuous
7	Soyabean seed	30,000 bag per day	100Kg. each bag
8	Capacity of Plant	300per day	ton
9	Refinary	1	lunit
10	D.O.C.	17% oil extract from seed & rest of the d.o.c.[deoxydising cake]	Per day
11	Hexane	10-12	Liter

**Table:4 Jaiswal NECO solvent extraction plant, Hingna, Nagpur, M. S, India.**

**Costing :** Low cast of oil production as compare to conventional mill.

**Output :** Enhance the productivity of plant.

**Conclusion & Result :** The four solvent extraction plant output is 1. Hence probability is unique. Heavy demand of industrial technical problem. Modernisation need of plants. Computational Fluid Dynamics Software, Ansys based to use such industries. Total quality contro Policies not used earlier, Ergonomics system not used, maintenance technique not in force. Method engineering , System engineering not aware in industry. All these activity need to be implemented to improve the Productivity of solvent extraction plant.

**Significance:**

- 1] Owner 25% more profit.
- 2] In a limited time period maximum production rate will increase.
- 3] Reduce the oil loss in DOC.

**Abbreviation:**

DOC- Deoxidising Cake

MIDC- Maharashtra Industrial Development Corporation

**Acknowledgment:** We are very much thankful to Dr. R. L. Himte, Professor & Head of Mechanical Engineering Department, Priyadarshini Institute of Engineering & Technology, Nagpur, Maharashtra, India. Encourage to do the research work, on this topic.

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