Box 132

NOTICE: If the film image below is less clear than this notice, it is due to the quality of the document being filmed.

Through aggressive market development programs in the private sector UCIL increased its sales of Sevin from 0.9 million lbs. in 1970 to 2.4 million lbs. in 1972, increasing its share of the insecticides market from 5% to 9%. Its market share in 1972 was restricted by allowable imports of Sevin whereby additional demand for approximately 1.75 million lbs. could not be met. It is anticipated that sales growth will continue to be restricted, so long as imports are necessary.

Once local manufacture begins, however, continuation of UCIL's aggressive market development program, abetted by a concurrent enforced decline in the consumption of chlorinated hydrocarbons and phosphates, are expected to gain a 22% share of the insecticide market by 1978.

To date, all Sevin sales have been of formulated material based on imported technical Sevin. When local production begins, only half of it can be formulated by UCIL, according to the Letter of Intent. The other half must be sold to independent formulators. To maintain quality control of the product of the independent formulators, UCIL plans a training program for these people, supervision of production in the early stages, and testing of each batch produced. Under this scheme the outside formulators cannot use the "Sevin" trademark but will be able to claim quality certification by UCIL. A beginning has been made by sponsoring a local formulator in western India for the low concentrate dust market. From the prototype, it is expected a number of such formulators will be set up in various states to provide an efficient distribution system. Emphasis on this activity will be on dust formulation because production of this form is the least sophisticated.

Temik will be manufactured with imported MIC and Temik oxime until UCIL's MIC plant is commissioned. Imports of Temik oxime from UCC are expected to continue indefinitely, since there are no plans for local production. On the basis of sales development work, UCIL is confident of fulfilling its Temik marketing program.

Selling Price

Imported technical Sevin now costs small formulators $1.20/lb. and formulated Sevin sells at an average price of $2.10 per pound of technical content.

Box 132

NOTICE: If the film image below is less clear than this notice, it is due to the quality of the document being filmed.

When local production begins, UCIL plans to sell technical Sevin at its present price of $1.20/lb. and formulated Sevin at $2.00/lb. of technical Sevin content. In order to keep the gross margin at a rate normally encouraged by GOI, prices have been assumed at these conservative levels, despite Government of India policy of border closure once local manufacture begins. The figures given in Schedule 'D' are only indicative of the basis for arriving at these prices, and are subject to change.

Future Development

Although the justification of the proposal is based on Sevin and Temik 10 G sales, UCIL believes it can develop other carbamates for the Indian market more expeditiously and at a lower cost than could be done in the U.S. Not only are the GOI testing requirements less stringent than those in the U.S., but also normal planting patterns in India run to two crops per year.

The development of Temik granular insecticide, Sirmate, and UC-30045 will be of particular interest. Development work on Temik has been essentially completed and a considerable amount of ground work has been done for Sirmate and UC-30045.

Proposal

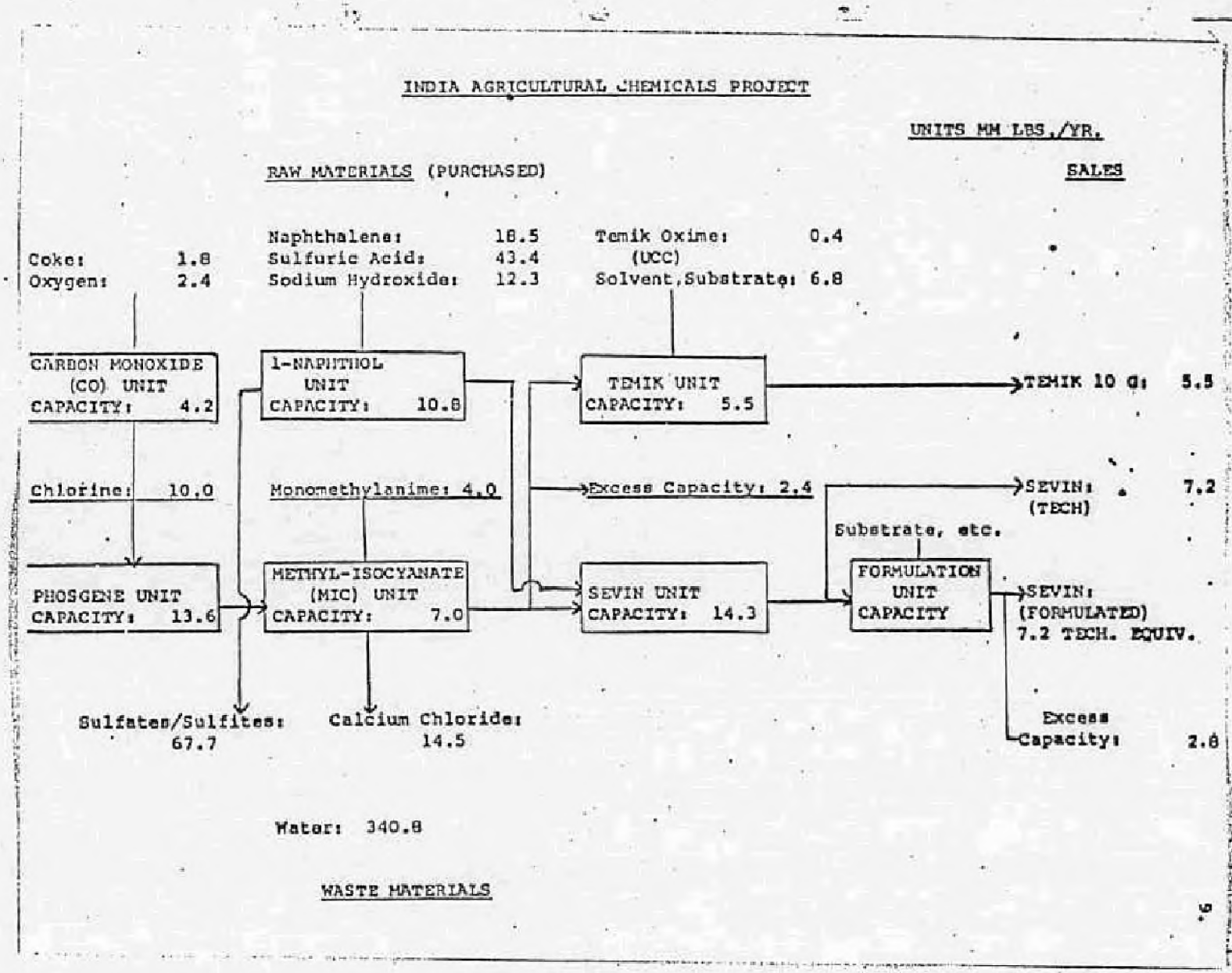
To meet this growing demand in Sevin and Temik in compliance with GOI requirements of local manufacture, the following facilities are proposed:

Unit	Capacity MM Lb./Yr.	Technology Source	Status	Start-Up Date	Cost ($000)
CO	4.2	UCIL	Conceptual	7/76	1,270
Phosgene	13.6	UCC	Commercial	7/76	1,680
MIC	7.0	UCC	Commercial	7/76	5,860
1-Naphthol	10.8	UCIL	Pilot Plant	1/76	5,800
Sevin	14.3	UCC	Commercial	1/76	5,190
Temik 10 G	5.5	UCC	Commercial	1/76	610
Sevin Formulation	7.2 (1)	UCIL	Operating	-	2,030
					22,640

(1) Technical Sevin Content.

For ready reference, a flow sheet follows on the next page.

Box 132



UCC 04203

Box 132

NOTICE: If the film image below is less clear than this notice, it is due to the quality of the document being filmed.

The methyl isocyanate unit has been designed with an excess capacity of 2.4 million lbs. per year (at an additional cost of $1.36 million) in anticipation of expansion of present carbamates or production of new carbamates such as Sirmate and UC-30045. In turn, the phosgene and CO units are sized in support of the MIC unit. Such expansions, or new production, will accordingly require additional investment only for carbamoylation facilities, up to the capacity of the MIC unit.

The present formulation unit at Bhopal, built with working budget funds to handle imports of technical Sevin, has a capacity to convert 10 million pounds of technical Sevin into various formulations of dusts, wettable powders, and granulars, more than enough to handle the contemplated load of 7.2 million pounds, half the technical Sevin output.

The proposed plant location is Bhopal, site of the formulation plant, due to its central location, good rail communications, proximity to sources of raw materials, and low land cost. Sixty acres have already been obtained on a 99 year lease at an annual rental of $4.88 per acre.

Alternative Processes

Where suitable, the processes now in commercial use at UCC's Institute Plant for the manufacture of Sevin have been specified. Exceptions are:

1. CO Process

The UCC process is unsuitable because it is based on methane, which is unavailable at Bhopal.

Two other processes, based on coke in one case and coal in the other, were investigated but rejected; in the first instance because the license fee, payable in U.S. dollars, was considered as unnecessary foreign exchange drain; and in the second, because no coal of suitable quality was available. Instead UCIL has elected to develop its own process, based on coke, with the help of an India-based consultant. A pilot plant is now being built.

2. 1-Naphthol Process

The UCC process involves sophisticated technology in equipment requiring unusual materials of construction and is best suited to large-scale production. The Indian environment is not favorable in any of these aspects.

Box 132

NOTICE: If the film image below is less clear than this notice, it is due to the quality of the document being filmed.

In consequence, UCIL has developed a process requiring less technical knowledge to operate and fewer alloys. A pilot plant has been operated successfully for the past year and a half, and has provided sufficient data for design of the large scale unit needed.

A comparison of the two processes shows that based on a transfer price of 62.7¢/lb. the return on investment is the same at 14.8% between the two processes.

	¢/lb. of 1-Naphthol	
	UCC Process	UCIL Process
Investment:	113.0	54.0
Transfer Price:	62.7	62.7
Period Expense	4.4	2.9
Raw Material	29.8	43.3
Other Costs	2.7	4.2
Total Plant Cost	36.9	50.4
Depreciation	9.0	4.3
R.O.I.I.	16.8	8.0
% R.O.I.	14.8	14.8

With the modest return required for overall cost to be the same, it is adjudged that the UCIL process may compare quite favorably in cost to the UCC process, particularly since the yields assumed for the UCIL process have already been substantially bettered on the pilot plant basis.

Environmental Protection and Waste Disposal

The waste streams of major concern are toxic and acidic. A vent gas scrubbing system to treat toxic vent streams from the MIC complex is provided, with the outlet connected to a flare tower. Acidic streams are neutralized and discharged into an open lagoon for solar evaporation of the water and settlement of the solids. Sanitary wastes are treated in septic tanks.

Total investment involved is $668,000 with an estimated annual operating cost of $512,000.

Box 132

NOTICE: If the film image below is less clear than this notice, it is due to the quality of the document being filmed.

Further description and detail on the above may be found in the Appendix.

The systems described have received provisional endorsement by the Public Health Engineering Office of the State of Madhya Pradesh in Bhopal. At present there are no State or Central Government laws and/or regulations for environmental protection, though enactment is expected in the near future. It is not expected, however, that this will require any design modifications.

Technology Risks

The comparative risk of poor performance and of consequent need for further investment to correct it is considerably higher in the UCIL operation than it would be had proven technology been followed throughout. CO and 1-Naphthol processes have not been tried commercially and even the MIC-to-Sevin process, as developed by UCC, has had only a limited trial run. Furthermore, while similar waste streams have been handled elsewhere, this particular combination of materials to be disposed of is new and, accordingly, affords further chance for difficulty. In short, it can be expected that there will be interruptions in operations and delays in reaching capacity or product quality that might have been avoided by adoption of proven technology.

UCIL finds the business risk in the proposed mode of operation acceptable, however, in view of the desired long term objectives of minimum capital and foreign exchange expenditures. As long as UCIL is diligent in pursuing solutions, it is their feeling any shortfalls can be mitigated by imports. UCC concurs.

Start-Up Schedule

Following is the start-up schedule:

Formulation Plant	In Operation
Temik 10 G, semi-works	3 Qtr. 1973
Sevin, 1-Naphthol	1 Qtr. 1976
Temik 10 G, full scale	1 Qtr. 1976
Phosgene, CO, MIC	3 Qtr. 1976

Technical Sevin is now being imported as the raw material for the formulation plant. MIC and Temik oxime will be imported to support Temik manufacture until the MIC unit is completed, after which only the oxime import will be required.

Box 132

NOTICE: If the filmed image below is less clear than this notice, it is due to the quality of the document being filmed.

While Sevin carbamoylation and 1-naphthol units are expected to be ready before the MIC complex, output of Sevin will probably be curtailed by import limitations on imports of MIC as well as by shakedown operations in the newly developed 1-naphthol unit.

Fixed Investment

New fixed investment, which includes those of the CO, phosgene, MIC, 1-naphthol, and carbamoylation units together with required utilities and general facilities, totals $20 million within an accuracy of ±25%. The estimates for all units except the 1-naphthol unit were developed on a U.S. basis by the UCC C&P Engineering Department and translated to an Indian basis by UCIL in collaboration with two Indian engineering firms who have been engaged to do the detailed engineering. Breakdown of this investment is given in Schedule 'H'.

Transferred investment totals $2.64 million and includes working budget items, past and present, covering the formulating plant; the 1-naphthol pilot plant; R&D laboratory; fabrication shop; Temik carbamoylation, granulation, and encapsulating unit; and pre-project facilities. Details are given in Schedule 'I'.

Working Capital

Working capital requirements are based on 60 day receivables for formulated materials and cash sales for technical Sevin; 12% of net operating cost for cash; and on detailed estimates for inventories.

Raw Materials

With the exception of aldicarb oxime for Temik, petroleum coke for carbon monoxide, and catalyst for Sevin, all raw materials will be procured from local sources. Petroleum coke, though produced in India, is in extremely short supply. Oxime is the only import from UCC.

Estimated delivered (Bhopal) costs are given in Schedule 'J'.

Box 132

NOTICE: If the film image below is less clear than this notice, it is due to the quality of the document being filmed.

Manufacturing Cost

Estimated total plant costs are as follows:

	Direct, ¢/Lb.	Overhead ¢/Lb.@ Capacity	Total ¢/Lb.	Details in Schedule
Final Products				
Sevin, Technical	54.6	11.7	66.3	H
Sevin, Formulated	138.0	9.0	147.0	P
Temik 10 G (MIC Mfg.)	53.5	4.8	58.3	O
Temik 10 G (MIC Imp.)	60.2	4.7	64.9	O
Intermediates				
Carbon Monoxide	7.3	3.2	10.5	L (i)
Phosgene	5.3	0.9	6.2	L (ii)
MIC	48.2	6.0	54.2	L (iii)
1-Naphthol	47.9	2.6	50.5	L (iv)

Other Costs

SAD

Technical Sevin will be sold for cash ex-factory, hence no selling or distribution costs will be involved.

Formulated product is estimated to incur selling expenses of 5.2% of sales value and 14.2¢/lb. distribution cost.

In both instances, administration costs are estimated to be 3% of sales value.

POE

Preliminary operating expenses are estimated to be $2,050,000 over the first three years of operation.

Service Fees

A technical service fee of 2½% of NIPS has been assumed on all products sold.

Box 132

NOTICE: If the film image below is less clear than this notice, it is due to the quality of the document being filmed.

Project Outcome

Probable Case

	DCF %	Average R.O.I.%	Payback Year
Sevin/Sevin Formulation	11	24	1988
Temik 10 G	14	31	1987
Composite	12	25	1987

Sensitivity

Change in Return, Percentage Points per 10% Change in:

	NFI		VOLUME		PRICE		COST	
	DCF	ROI	DCF	ROI	DCF	ROI	DCF	ROI
Sevin/Sevin Formulation	1.1	2.2	0.4	0.4	3.9	7.2	2.2	4.1
Temik 10 G	0.3	0.5	0.8	0.9	6.6	12.5	5.6	10.4

The production of Technical Sevin might be carried on independent of the formulation activity. In this case, the DCF return would be 10% and the Average ROI 22%. Since the reverse, the long-term production of formulated product without production of Technical Sevin, is not possible no separate calculation of returns has been made for this case. Rather, the results of the combined activity, as shown in the table above, have been calculated as the realistic situation.

The outside formulator can operate independently, however. While he presumably will not be working on the high-priced, high-margin granular formulations requiring considerable technical service that UCIL will formulate, it may be assumed his margin will be at least as good as UCIL's due to lower overheads. With due note he pays no service fee but does have a higher working capital (due to raw material inventory valued at the sale price of Technical Sevin rather than at its cost) his return might be 12% on a DCF basis, 24% in Average ROI, indicating that the projected sales price of Technical Sevin of $1.20 is reasonable.

Box 132

NOTICE: If the film image below is less clear than this notice, it is due to the quality of the document being filmed.

Downside Risk:

India is essentially a "cost plus" market with agricultural chemicals in short supply and margins are unlikely to be affected by cost variations. Therefore, the likely deviations from the most probable case can be expected to result from delays which would cause increases in fixed investment through further escalation of costs. The downside risk analysis shows an NPV of ($804,000), a DCF return of 9% and an average ROI of 23% based on the following assumptions:

NFI:	10% Increase (From Probable Case).
Start-up:	One year later.
Volume:	No change (From Probable Case).
Price:	No change (From Probable Case).
Cost:	No change (From Probable Case).

Project Financing

This proposal will not require fresh financial commitment either in the form of additional dollar investment or guarantees for loans on the part of UCC.

However, GOI's approval for implementation of this proposal is contingent upon a reduction of UCC's equity in UCIL. Financing this project will require issue of new equity at premium, amounting to 25% of the new fixed investment, to the Indian public.

The detailed finance item is included in a separate section of the proposal.

UCC Technical Help Required

Engineering

Design

UCC C&P Engineering is developing the process design for the naphthol refining, phosgene, MIC, and Sevin carbamoylation units. It is also reviewing the process design done in India for the naphthol unit other than refining.

One man has been assigned for whatever on-going liaison and assistance may be necessary through start-up.

BOX 132

NOTICE: If the film image below is less clear than this notice, it is due to the quality of the document being filmed.

Detail Engineering and Construction

One man has been loaned to UCIL to act as Project Manager until start-up.

Start-Up

	Number	Months
Production Specialists	3	12
Process Engineer	1	See Above

Training of UCIL Personnel (In U.S.)

	Number	Months
Process Engineers	6	3 - 4
Production Engineers	3	6
Laboratory Chemist	1	3
Instrument Engineer	1	6
Maintenance Engineers	2	6

Performance Reviews

New Fixed Investment — 4Q 1976
Basis: $20,000,000

Business Performance to Cover Year of 1977 — 1Q 1978

Bases:

	Sevin	Temik 10 G	Total
Sales, MM Lbs.	12.35	3.31	-
Price, $/Lb.	1.60	0.94	-
NIFS ($000)	19,760	3,111	22,871
Operating Income ($000)	6,282	584	6,867
ROI % (Project For 1977)	17	19	17

Box 132

NOTICE: If the filmed image below is less clear than this notice, it is due to the quality of the document being filmed.

APPENDIX I

Environmental Protection and Waste Disposal

The waste streams of major concern associated with the Sevin project are primarily toxic and acidic. The waste disposal system provided for environmental and occupational hazard protection covers the treatment and disposal of all gaseous, liquid and solid waste streams in the most practical manner acceptable to local authorities. The system employed has received provisional endorsement by the Public Health Engineering Office of the State of Madhya Pradesh in Bhopal.

The estimated net fixed investment and annual operating cost along with a brief description of each group of the disposal facilities provided follows:

1. Disposal of Sanitary Wastes

The sanitary waste disposal facilities contemplated will consist of septic tanks complete with filtration chambers and soaking pits. The effluent will be discharged through a common sewer to an existing nearby creek being used for public waste disposal.

Estimated N.F.I.	$22,000. (India basis)
Annual Operating Cost (Estimated):	$ 1,500

2. Occupational Health Hazard, Protection of Plant Personnel

A vent gas caustic scrubbing system for destroying toxic and poisonous vent streams for the CO, phosgene, and MIC complex is provided along with a flare tower that will be equipped with a specially designed combustion chamber to destroy all toxic materials and will be of sufficient height for safe disposal of the products of combustion. In addition, breathing air and other detection and safety equipment such as air respirators, pocket respirators, self-contained breathing apparatus, portable gas analysers, carbon monoxide detectors, etc., will be made available to all operating personnel working in these areas. The design is based on that of the Institute, West Virginia plant.

Estimated N.F.I.	$290,000
Estimated Annual Operating Cost	$135,000

Box 132

NOTICE: If the film image below is less clear than this notice, it is due to the quality of the document being filmed.

3. Non-Combustible Liquid/Solid Wastes

Facilities are provided for neutralization of a hydrochloric acid stream from the MIC unit and a sulfuric acid stream from the 1-naphthol process.

Since both streams contain organic residues, a skimming pond has been provided for removal of organic layers after neutralization, with subsequent disposal by combustion in the plant incinerator.

The neutralized effluent from the skimming ponds, together with other sulfate/sulfite containing streams from the process, will be discharged into an open lagoon for solar evaporation of the water and settlement of the solids. When one lagoon is filled with solids, another will be constructed, land for which is available in the immediate area. Each lagoon will be lined to prevent seepage into underground water supplies.

Estimated N.F.I.	$356,000
Estimated Annual Operating Cost	$375,300

The expected composition and flow rate of treated waste effluent discharged into the pond from the above facilities is:

Calcium Chloride	2,896	Lbs. at 5000	Hrs./Yr.
SNS - Salts	440	" at 7000	"
Sodium Sulfate	2,931	" at 7000	"
Sodium Sulfite	2,106	" at 7000	"
Calcium Sulfate	3,160	" at 7000	"
Calcium Naphtha Sulfate	686	" at 7000	"
Organic Residues	344	" at 7000	"
Water	48,680	" at 7000	"
	61,243 Lbs./Hr.		

Virtually all gaseous effluents will be combustion by-products released from the flare tower at sufficient height for proper dispersion.

The only untreated gaseous waste will be a stream of nitrogen containing a small amount of hydrocarbon as indicated