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**HIGH-LEVEL ADVISORY SERVICES FOR THE BAIKALSK  
PULP AND PAPER MILL**

SI/RUS/94/801

RUSSIA

**Technical report: Mechanical wood processing\***

Prepared for the Government of the Russian Federation  
by the United Nations Industrial Development Organization,  
acting as executing agency for the United Nations Development Programme

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\* This document has not been edited.

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**SUMMARY**

This report which should be considered as a prefeasibility study will discuss the existing and proposed Mechanical Wood Processing activities of Baikalsk Pulp and Paper Mill and its subsidiary company CREAL which have or are intended to be introduced as an alternative source of employment for the citizens of Baikalsk.

It is the intention of the report to identify the strengths and weaknesses of both the existing and proposed mechanical wood processing activities and make recommendations as to the way forward following the final decision on the future activities of the Pulp and Paper Mill.

## CONTENTS

	Summary
1.0	Recommendations
2.0	Conclusions
2.1	Log Purchasing
2.2	Log Receipt and Handling
2.3	Existing Mechanical Wood Processing
2.3.1	Sawmill Phase I
2.3.2	Wood Product Manufacture
2.3.3	Timber Frame Housing
2.4	Proposed Mechanical Wood Processing
2.4.1	Sawmilling
2.4.2	Kiln Drying
2.4.3	Machining
2.4.4	Log Housing
2.5	General
3.0	Log Purchasing
3.1	Transport Costs
3.2	Price
3.3	Comment
4.0	Log Receipt and Handling
4.1	Comment
5.0	Existing Mechanical Wood Processing
5.1	Sawmill Phase I
5.1.1	Comment
5.2	Wood Product Manufacture
5.2.1	Manufacturing Criteria
5.2.2	Kilns
5.2.3	Conversion Mill
5.2.4	Secondary Machining
5.2.5	Furniture
5.2.6	Panel Line
5.2.7	Sales and Marketing
5.2.8	Comment
5.3	Timber Frame Housing
5.3.1	Company Background
5.3.2	Manufacturing Operation
5.3.3	Raw Materials
5.3.3.1	Structural Timbers
5.3.3.2	Non Structural Timbers
5.3.3.3	Joinery Products

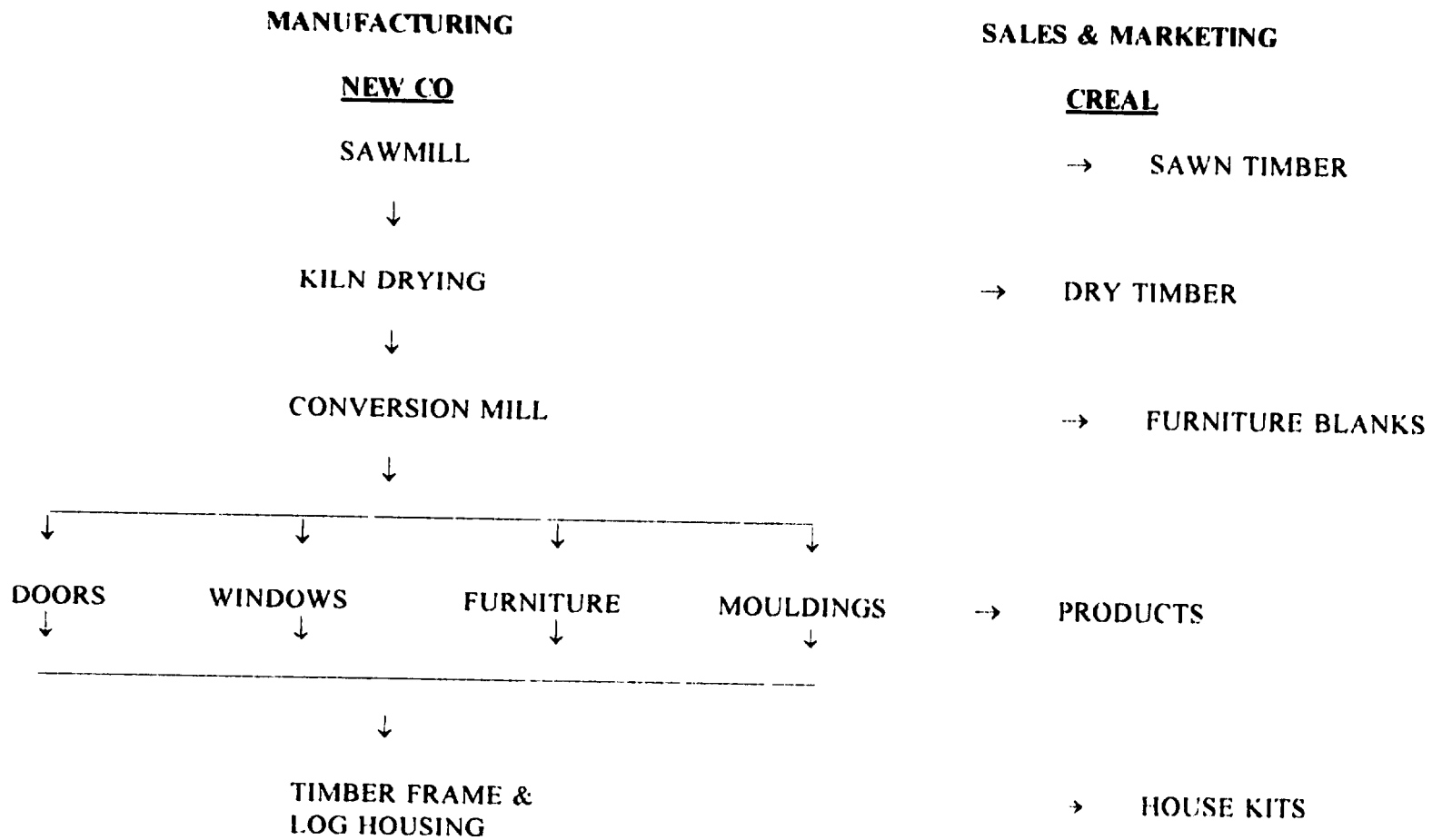
5.3.3.4	Insulation Materials
5.3.3.5	Sheet Materials
5.3.4	Design and Structural Requirements
5.3.5	Sales and Marketing
5.3.6	Regulatory Bodies
5.3.7	Comment
6.0	Proposed Mechanical Wood Processing
6.1	Sawmilling
6.1.1	Canadian Morbark
6.1.1.1	Kiln Drying
6.1.1.2	Sawmill
6.1.1.3	Planer
6.1.2	Worster & Dietz
6.1.3	Comment
6.2	Log Housing
6.2.1	Comment

## 1.0 Recommendations

- The existing mechanical wood processing operations should be brought together within one new company (Sawmill, Furniture Factory, Timber Frame Housing)
- CREAL should become the Sales and Marketing arm of the new company (New Co)
- A market survey should be implemented to determine the demand (Irkutsk and adjacent regions) for the following categories of products
  - a) Entrance and Pass Doors for existing and new houses and apartments
  - b) Windows for existing and new houses and apartments
  - c) Furniture
  - d) Architraves and Mouldings
  - e) Timber Frame and Log housing
- The possibility of selling to countries of the Pacific Rim some or all of the above products should be evaluated
- According to the results of the Market Survey, coupled with the final decisions in regard to the future of the Pulp and Paper Mill a phased development plan for the New Co incorporating each of the proposed product lines should be produced
- The Furniture Factory currently being equipped should be used as a training school with other premises being made available for manufacturing according to the business plan developed.
- Work on the Furniture Factory and Sawmill should cease until the business plan is developed.
- For each product line there should be a separate Development Plan so that the company can develop in a balanced way and according to the needs of the market place
- It is expected that timber frame housing will develop most slowly but have the ability to draw the majority of its timber based products from the other production departments. The lobbying of local and regional government for new legislation in house building should continue
- An indication of the possible structure of New Co and its interrelationship with CREAL is shown in Figure I.

FIGURE 1

PROPOSED COMPANY STRUCTURE



## **2.0 Conclusions**

### **2.1 Log Purchasing**

- In attempting to secure logging rights for itself the BPPM has made the right decision in trying to control log prices. The prices being paid are comparable to those being paid in other parts of Russia
- The economics of the purchase of 24.0 metre long railway carriages for whole log transportation must be carefully considered in terms of:-
  - cost of investment, capital and interest
  - cost of transportation given that the railway carriage has to make two journeys (1 full and 1 empty) to complete the cycle.

### **2.2 Log Receipt and Handling**

- Within the existing facilities it is necessary to create a log separation area whereby Pulp and Mechanical Wood Processing logs can be sorted. This should be close to the facility for long log cutting which is presently being built.

### **2.3 Existing Mechanical Wood Processing**

#### **2.3.1 Sawmill Phase 1**

- The sawmill under construction does not have the capacity indicated in the company's report.
- Operating the mill on 3 shifts instead of the one shift indicated in the report would increase the manning levels 3 fold and theoretically allow the company to produce 80% of the required output
- The sawmill under construction does not have length cutting facilities for sawn wood, neither does the furniture factory which cannot process timber longer than 2.0 metres.

#### **2.3.2 Wood Product Manufacture**

- The kilns do not have the required capacity for the timber to be processed.
- The equipment proposed is only suitable in part for the manufacture of the furniture proposed and not at all suitable for the proposed manufacture of laminated panels.
- The layout of the factory is not conducive to good working practice and



production in commercial volumes.

- Much of the equipment proposed is incapable of achieving commercially acceptable quality standards.
- The company should rethink the Business Plan.

### **2.3.3 Timber Frame Housing**

- The company premises are inadequate for the commercial manufacture of Timber Frame Housing.
- The equipment and processes are inadequate for the commercial manufacture of Timber Frame Housing.
- The quality standards achieved are acceptable but the rework time necessary to achieve this quality is unacceptable.
- The progress made on sourcing raw materials in the 3 years of the company's existence is poor even allowing for the known difficulties related to insulation and sheet materials.
- The lack of progress in developing new designs, both in house size and style, in an attempt to overcome the "psychological barrier" is unacceptable.
- Given that the company has only sold 3 houses in 3 years it is the consultant's view that the company needs to completely rethink its sales and marketing policy starting with house size and style.
- The company is to be congratulated on obtaining the support of the Chief Architect of the region. This support and the support of other officials of influence is important if Timber Frame Housing is to become a serious alternative to Brick Housing.
- In general terms it must be the consultant's view that the conditions both in the company and the market place are not yet right for large scale Timber Frame Housing Manufacture. The company should therefore concentrate on the questions of sourcing raw materials and determining the requirements of the market place. The company should not enter into speculative house building until such time as these questions have been answered satisfactorily.

## **2.4 Proposed Mechanical Wood Processing**

### **2.4.1 Sawmilling**

The company is in possession of a number of proposals of varying age and criteria. A master plan should be developed in which the demand criteria should be determined. The company's potential suppliers should then be asked to quote against the criteria at the same time giving the calculations in support of their equipment performance claims.

### **2.4.2 Kiln Drying**

The comment regarding sawmilling is also applicable to kiln drying.

### **2.4.3 Machining**

The comment regarding sawmilling is also applicable to machining.

### **2.4.4 Log Housing**

The comment regarding sawmilling is also applicable to housing.

## **2.5 General**

- Baikalsk PPM has entered into the field of Mechanical Wood Processing (MWP) in a sporadic manner and without evidence of an overall plan
- All senior personnel have been transferred to MWP from Pulp and Paper manufacture and have had little experience of the industry in which they are now trying to operate.
- This sporadic development coupled with the inexperience of the management has led to the establishment of 3 separate entities which should be but are not linked with each other
- This development has also meant that the market needs for each of the projects has not been identified with any degree of accuracy, if at all
- The company's policy on log buying and the gradual change to whole log receipt has merit. This policy will assist the PPM to become competitive in the Mechanical Wood Processing industries despite the higher than average wage being enjoyed in relation to the Region and industry norms. However advantage must be taken of semi-automatic/automatic MWP and the efficiencies of energy and waste utilisation offered by the PPM if the MWP is to be successful

- The skill levels achieved by the personnel within the existing MWP departments are adequate but would require the introduction of a formal training programme to enable the operatives to achieve Western European performances and quality levels.

### 3.0 Log Purchasing

Pulpwood is currently brought to the Mill by rail from logging sites up to 1300 km distant. The average price in March 1995 was 118,000 Rbs/m<sup>3</sup> overbark including VAT (20%), Special Tax (3%) and transport, which, at Rbs 4500 = US\$ 1, is equal to U.S.D. 26.22)\*

At the present time the mill has 2 major sources, one is some 800 km from the mill and the cost of the timber is 60,000 Rbs/m<sup>3</sup> + VAT, S.T. + Transport. Whilst the second is at a distance of 1300 km from Baikalsk and the cost of the timber is 40,000 Rbs/m<sup>3</sup> + VAT, S.T. + Transport. The cost of pulpwood in proportion to the transport cost is high but irrespective of the distance travelled the price at the mill for timber from the different regions remains comparable, with the price of timber dropping as the rail costs increase.

It is the opinion of Mr. Rybin, Director of Purchasing, that the cost of logs bought specifically for sawing will be approximately 30% more than the delivered price of pulpwood (ie 153,400 Rbs/m<sup>3</sup>). This price at a rate of 4500 Rbs/U.S.D. equates to U.S.D. 34.09 (March 1995). It is the writers experience that this price is comparable to the delivered cost of logs in the Urals and Western Siberia in the first 3 months of 1995. At this time no sawlogs were being purchased, the Wood Processing Department selecting the best of the pulpwood logs for their needs as required.

It is also important to note that the trend of pulpwood prices, and by association sawlogs, (as reported by UNIDO SALAMA) is upwards:

	1993	1994	1995	(KING 95)
USD	8	15	23	26

and that this trend has also been experienced in the Urals and Western Siberian.

From the above it will be seen that there are two important elements in current log purchasing:

- Transport
- Increasing log prices

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\* March 1995

It is therefore important that the company take all possible steps to diminish the effect that these elements have on their raw material purchasing.

Mr. Rybin indicated that his department were addressing the problems in the following manner.

### **3.1 Transport Costs**

In an effort to reduce the transport costs the company has purchased a number of 24.0 metre long railway wagons for the transportation of whole logs.

According to the company the cost of double transportation (loaded from logging site to mill and empty from mill back to logging site) is less than the cost of hiring a one trip railway wagon from the state railway. A further advantage of 24.0 metre whole log wagons is seen as being cheaper logs and a higher recovery rate.

It was not possible for the consultant to check the calculations and draw conclusions for inclusion in this report. However, it is recommended that the situation is monitored closely given the current rate of inflation, cost of transportation and finance in Russia at the present time.

### **3.2 Price**

In addition to the perceived savings envisaged by whole log conversion the company is actively seeking their own log concessions through the purchase of existing logging companies. This action will allow the company to control the price of some if not all its log purchases.

### **3.3 Comment**

In terms of mechanical wood processing (MWP) the company will be buying logs from distances greater than the accepted norms of those countries who add value to their own raw material. The logs purchased for MWP will be processed into products in Baikalsk before being shipped to the end user, either in the Irkutsk region or other parts of Russia, or exported. Therefore it makes little difference whether the product is transported in its finished or raw material state as the cost of transporting finished products by container is comparable to the cost of transporting the necessary raw material in open wagons, in volume terms.

That area of transportation cost that the company can control is distance and as far as possible the company should continue to seek sources of raw material closer to the mill without paying a premium for the logs.

#### **4.0 Log Receipt and Handling**

The logs are currently received in 3, 4 and 6 metre lengths and as discussed in the previous section the company is in the process of bringing long length carriages into operation to facilitate the receipt of whole logs.

Under the present system the logs are unloaded by overhead gantry cranes and put into temporary storage before being transported by the same gantry cranes to three log handling decks which feed them to the wet debarkers and chippers. The company has received a number of quotations for dry debarking systems which are currently being analyzed by the company.

#### **4.1 Comment**

Any system for log handling must allow for the selection and retrieval of saw log quality material either from the 3, 4 or 6 metre long log receipts or from the 24 metre logs which the company is beginning to purchase and move by means of its own carriages.

#### **5.0 Existing Mechanical Wood Processing**

Following the issue of a state decree for companies to diversify (reprofiling) the company established a new department under the management of Rem L. Latipov.

The company's first project was the formation some 4 years ago of a department to manufacture spring bed mattresses. This department is housed in a single storey building within the pulp and paper making complex. The unit is operating successfully using purpose built machinery for the manufacture of springs, mattress structure, upholstery and sewing. The production is sold locally and within the neighbouring regions.

In addition to the mattress department two more projects have been instigated by the management team:

- Sawmill
- Wood Product Manufacture

A third project, Timber Frame Housing, has also been started through the creation of a Russian/German Joint Venture which trades under the name of CREAL and operates as a separate company within the BPPM under the management of its General Director, Mr V.A. Kuchumov.

## 5.1 Sawmill (Phase I)

The company has prepared a project internally for the processing of 50,000 m<sup>3</sup> of saw logs (90% pine 10% birch). The premises for the sawmill are adjacent to the existing mattress production plant and will use an existing shed for storage. The building for the sawmill is still at the foundation stage. The site is served by a spur line from the branch railway line serving the factory.

The equipment proposed comprises:

- Circular Saw Sleeper Machine
- Frame Saw.

Both machines are of Russian manufacture, and utilise tried and tested technology.

However it is the consultant's opinion, on the basis of calculation, that the equipment will not perform at the production levels calculated by the company (50,000 m<sup>3</sup>/1 shift/11 operatives). The view of the consultant is that the plant will have a capacity of 40,000 m<sup>3</sup> in 3 shifts and employ 38 operatives. It should also be noted that this proposal does not include any length cutting facilities and the proposed mill can only despatch timber according to the length in which it is received in log form.

### 5.1.1 Comment

The sawmill has been designed according to the technical criteria contained in text books. It is believed by the consultant that this information has been misinterpreted by the company and that inordinately high production figures have been produced as a result. These figures have not been questioned due to the lack of experience in the company of sawmilling.

As a consequence the financial calculations of the project should be re-evaluated and the appropriate decisions made.

## 5.2 Wood Product Manufacture

The project feasibility study for the manufacture of furniture was originally prepared by the Industries Special Projects Institute in Nizhni Novgorod (now disbanded). The Institute proposed the manufacture of wooden bed frames to complement the mattresses already in production by the company. The technological process to be used was to be of the traditional Russian type using equipment of Russian manufacture.

All of the equipment has been purchased and an existing 2 storey building, adjacent to the mattress plant is in the process of being refurbished with some equipment having already been installed.

During the time since the proposal was received the company has decided to expand the product range to include cabinets, chairs and panel products for the inner market with the addition of some more equipment to make the panels.

Evaluation of the proposed equipment, process and building layout by the consultant would suggest the following:

### 5.2.1 Manufacturing Criteria

- 5000 m<sup>3</sup> Input comprising 90% softwood, 10% hardwood
- Two shift operation and a total of 150 employees
- Sales to the Irkutsk and neighbouring regions.

### 5.2.2 Kilns

It is the consultant's view that the kilns purchased and installed do not have sufficient capacity to dry the volume of timber proposed.

i.e. kiln capacity (2 x 15.0 m<sup>3</sup> = 30 m<sup>3</sup>)

Drying cycle:

- Pine 5 days to 8-10% m.c.
- Birch 12 days to 8-10% m.c.

Quantity 5000 m<sup>3</sup> :

Pine 90% = 4500 m<sup>3</sup>

Birch 10% = 500 m<sup>3</sup>

Total Drying Time:

4500 m<sup>3</sup> ÷ 30 m<sup>3</sup> x 5 days = 750 days

500 m<sup>3</sup> ÷ 30 m<sup>3</sup> x 12 days = 200 days

Total days drying required 950 days

Total days drying available 365 days (Theoretical)

On this calculation the kilns installed are only capable drying 38% of the total requirement without degrade. The situation could be improved by the use of air drying to reduce the initial m.c. from saturation point to 20 - 25% m.c. however the savings in kiln drying time are not thought to be greater than 20% of the overall drying time which would give a revised drying capacity of 48% of the total required. Air Drying could not take place during the summer months without antiseptic treatment of pine to prevent "bluestain".

### 5.2.3 Conversion Mill

This area will contain the following equipment:

- 1 - Crosscut
- 1 - Multirip
- 2 - Planers
- 1 - Thicknesser
- 1 - Moulder

Whilst the consultant has no comment to make regarding the type of equipment proposed the number of pieces of machinery are considered to be disproportionate to each other and to the volume of material to be processed. Whilst the terms of reference did not allow for a detailed analysis of the equipment, its theoretical and probable output levels, the consultant believes that particular attention should be given to the following machines.

#### X Cut Saws

The proposal calls for one of these machines. However it is the consultant's view that between 2 or 3 of these machines will be required both for the primary length and defect cutting of the timber from the kiln. It is not clear from the proposal and from discussions with the management team as to when or how timber in excess of 2.0 metres long is to be cut to length. The proposed layout of the furniture shop does not allow room for timber in lengths longer than this and the first phase sawmill has no length cutting facilities at all.

**Note:** The proposals examined for the second phase sawmill do contain length cutting facilities but these are designed for cutting timber to maximum length and not for the breaking down of long lengths into two or three shorter lengths.

Of concern also is the provision of only one moulder. This machine will be the main work centre for the factory and any stoppage of this machine will have a direct effect on the productivity of the department as a whole. The problem is further exacerbated by the company's decision to increase the range of products from the bunk beds originally envisaged. This decision will reduce the efficiency of all machines requiring tool and setting changes whereby shorter production runs will increase the number of set ups, thereby decreasing the time available for production.

A general comment regarding the area designated for the conversion mill is that the equipment has been placed too close together and the problems of material handling will inhibit the productivity of the equipment.



#### 5.2.4 Secondary Machining

The secondary machining area is laid out in a better manner as compared with the conversion mill. The equipment in this area comprises:

- Saws
- Mortiser
- Tenoner
- Spindle
- Finger Jointer
- Drill

It is again the consultant's view that the equipment proposed for final length cutting is inadequate for the amount of defect and final length cutting which will be required. It is also important to note that there is no equipment provided for the processing of timber in anything other than a straight form and that this will prove very restrictive in terms of the diversification programme envisaged by the company.

After the secondary processing the production is proposed to follow one of two processes:

- Furniture
- Panel

#### 5.2.5 Furniture

The furniture line is as designed by the Nizhni Novgorod Institute with no allowance for extra machines to accommodate the product diversification envisaged by the company. The equipment proposed is of Russian design and manufacture and the technological process is typically Russian comprising:

- |                   |   |                |
|-------------------|---|----------------|
| Pad Sanders       | - | Face Sanding   |
| Disc/Belt Sanders | - | Edge Sanding   |
| Spraying          | - | Hand Guns      |
| Drying Cabinets   | - | Hand Finishing |

This system of finishing is by the very nature of the equipment used liable to produce products of inferior quality either in terms of accuracy or quality. It is therefore impossible to consider the use of this equipment in volume production terms whilst trying to achieve an acceptable quality standard.

#### 5.2.6 Panel Line

This process line has been developed by the management team and is intended to produce edge laminated panels from pine to be used in the production of

furniture carcasses, desk tops, table tops etc.

The process envisaged by the company comprises:

- Two Sided Planer
- Multirip Saw
- Edge Laminating Press
- Two Sided Planer
- Panel Saw

#### Two Sided Planer

This machine will take rough sawn boards and plane the front and rear faces say 150 x 50 planed to 150 x 45 x length

#### Multirip saw

Will take the planed boards and rip them to component size say 150 x 45 to 5 x 27 x 45 x length

#### Edge Laminating Press

Will take the strips of timber and edge glue them to produce a panel say 10 x 27 x 45 to 27 x 450 x length

#### Two Sided Planer

The panels produced on the press will be passed through this machine to produce a surface planed panel of the required thickness say 27 x 450 to 21 x 450 x length

#### Panel Saw

Will cut the panels to finished length and width.

Whilst the theory of the process is sound the consultant has reservations regarding the quality of the finished product for the following reasons:

1. The two sided planer is capable of machining the surfaces of a rail parallel to each other however the design of the machine does not allow it to remove any twist or bow which may be inherent in the timber. As a consequence a bowed or twisted piece of timber will remain in that form after machining, albeit with two machined parallel faces.
2. On passing the rail through the multirip the rails which are produced will be subject to different stress factors causing more changes in twist and bow.

3. No provision is made in the process for defect cutting and unless timber of the highest quality is used and rigorous selection is employed in the conversion mill the panels will be of poor quality due to the incidence of deadknots, loose knots, splits, bluestain etc.
4. The rails from the multrip will proceed to the panel press for making into panels. At this stage the following problems are envisaged
  - a) Twist and bow in the rails will make good joints difficult and result in a high rejection rate of panels not glued properly.
  - b) Only the edges of the rails have been machined with the top and bottom faces being in the original sawn state. By its very nature rough sawn timber will vary in thickness and sawing quality. This coupled with the problems of bow and twist already discussed will result in panels with variations in thickness across their width and length.
5. From the press the panels will go to a second top and bottom planer. In order to correct the problems described in 4b) it will be necessary to plane the panel to the point at which all defects are removed. This exercise will result in an inordinate amount of timber being removed and therefore wasted.
6. The final operation envisaged is that of panel sizing. The wastage at this point will be very high given the problems which are considered to arise in the previous operations.

It is the consultants view that if the company wish to consider the manufacture of laminated panels they should re-examine the technological process and incorporate the following equipment into it:

Cross Cut (2)	Long length cutting and preliminary defect cutting
Moulder (2)	Prestraightening and 4 sided planing (multiples)
Cross Cut (2)	Defect cutting
Panel Press	
2 Sided Planer	Thicknessing
Panel Saw	Panel Sizing
Finishing	Minor Defect Repair
Panel Sanding	Finish Sanding Thickness + quality
Edge Profiling/Sanding	

### 5.2.7 Sales and Marketing

In developing its proposals for a Sawmill and Wood Products Manufacture the company appears not to have determined whether or not there is a market for the products envisaged either locally or for export. It is probable that in the light of the new structure in Russia that the need for items of housebuilding and home improvement will increase but it is important that the company determine as accurately as possible the form in which this demand will take. It is also important that the company consider the possibility of export both within the CIS and countries of the Pacific Rim as value added products must take preference over the export of raw materials and Baikalsk is better situated in transport terms to export to the East rather than the West

### 5.2.8 Comment

The equipment proposed and presently being installed is of traditional Russian technology which whilst acceptable for the cutting and machining of timber is no longer acceptable in Western Europe for the drying, sanding and polishing processes.

The original proposal by Nizhni Novgorod was for a plant to make simple beds using only straight rails and the equipment proposed reflects this intention. The company's decision to expand the range of products without adding new machinery will result in a very restrictive range of furniture.

The proposed laminated panel line has been designed by the management according to the information available from text books with the result that the proposal is lacking both process and practical considerations. There is an imbalance in the production capabilities of the equipment proposed which has been exacerbated by the proposed changes in the product types. The layout of the factory particularly the conversion mill is such that it will be difficult to achieve a satisfactory production through flow.

The enthusiasm of the management team cannot be faulted, however the inexperience of the team in the practicalities of furniture manufacturing coupled with shortcomings of the woodworking equipment proposed have resulted in a proposal which is not compatible with the output or quality standards expected by North American or Western customers.

A Business Plan has been developed by the management team but has not been checked and approved by the Financial Department of the company. Therefore the economics of the project cannot be considered to have been explored completely. The consultant's appraisal of the financial document, albeit very brief, would suggest that there are elements which require more detailed examination before the profitability of the proposal can be determined. It is accepted that in the first instance the project was developed according to the need to diversify and create jobs rather than the need to generate profit

contribution. However in the current circumstances this philosophy no longer applies and more accurate financial analyses are required

In this context a Sales and Marketing exercise needs to be carried out to determine the products which are needed rather than those which the company thinks it will make both in Inner Market and Export terms.

### **5.3 Timber Frame Housing**

Timber Frame Housing is being made and marketed by the company through its subsidiary company CREAL under the control of its General Director V.A. Kuchumov. This company which is a Russian/German J.V. was originally created as a commercial trading company. Following the decree on Diversification (reprofiling) the company entered into manufacturing.

#### **5.3.1 Company Background**

Following the decision of the founders of CREAL to diversify, a Canadian company was commissioned to assist in the development of a Timber Frame Housing System. During the summer of 1993 two Canadian Consultants worked with CREAL on the building of 3 Timber Framed Houses to designs provided by the Canadian company and based on timber/plywood panel construction. In addition to assisting with the practical problems of building, the consultants also set up a comprehensive computer based design, costing, and accountancy system for the company.

The three house styles built by the company are typically North American, however the exterior skin of the house is predominately brick as opposed to the timber shiplap boarding more commonly seen on houses of this type. The structural design criteria of the houses is based upon Canadian norms for Timber Framed Houses as laid down in the publication:

Canadian Wood Frame House Construction ISBN 0-660-12647-8  
Cat No NH M-3/1988E.

The structural design of the houses was made to encompass an Earthquake Factor of 9.0 which exceeds the limits determined for the Irkutsk region of 8.0 on the Richter Scale.

#### **5.3.2 Manufacturing Operation**

The company has its manufacturing operation in premises owned by but out with the BPPM site. The offices of the company are leased/rented in one of the office blocks on the BPPM site. The manufacturing site which comprises a small workshop and yard is used for the storage of material together with some manufacturing operations.

The system employed for the building of the first three houses comprised:

- Log receipt (selected from BPPM logs)
- Log Sawing - Logs are broken down on a portable log saw and carriage into structural timber sizes according to the design requirements
- Timber Drying (if required). The company operates a small capacity kiln
- Wood Machining. The company has a small number of machines for secondary wood processing.

The actual manufacturing of the wall panels was carried out on the building site using hand tools rather than manufacturing the panels in the workshop using automatic or semi automatic processes. The company has completed two houses during the first and second building seasons and the third is approaching completion in this the third building season. During the period of the UNIDO consultancy exercise the consultant has had the opportunity to examine the third house in detail and the first two houses superficially (both houses being occupied). In addition the company's marketing video was made available which enabled the consultant to gain some impression of the interior of the first two houses.

From the video and the exterior examination of the first two houses it would appear that an acceptable level of quality has been achieved. However, examination of the third house in more detail would suggest that the quality standards of the first two houses have been attained by an inordinate amount of finishing work (paint and filler) as the quality of the sub strata of the third house is very poor in terms of:

Wall, floor and ceiling boarding, door, window, skirting and architrave timber joinery and fixing quality.

Given that the company has been able to spend nearly one year on each of the properties, and that these properties have represented the show houses of the company it is to be expected that the quality would be acceptable. However, if the company is to build houses commercially it is imperative that ways are found to source higher quality raw materials and components and that they are assembled and the houses completed in a shorter time span

### **5.3.3 Raw Materials**

The normal components of a Timber Framed House Kit and those which will be considered in this report are:

1. Structural Timbers for - Walls, Floor and Roof
2. Non Structural Timbers for - Skirtings Architraves, Fascias, Wall Cladding etc
3. Joinery Products - Doors, Windows, Staircases
4. Insulation Materials
5. Sheet Materials for - Floors, Walls (Internal + External) Ceiling, Roof

Of the above the company is able to source the raw materials for items 1 and 2 in total and 3 in part from its own log supply which it then converts, dries and machines as required. Items 4 and 5 have to be bought in from other manufacturers or agents in the region.

#### **5.3.3.1 Structural Timbers**

The company selects logs of quality, length and diameter from the normal receipt of pulpwood logs by the BPPM. These are transported by lorry to the company's manufacturing site where they are broken down into structural sizes on a portable headrig of North American origin. The timber is then allowed to air dry or if necessary is kiln dried in the small capacity kiln operated by the company. Inspection of house 3 would indicate that some timbers had been installed wet as evidence of distortion on site was apparent.

The company does not employ stress grading in anything but an arbitrary fashion as the timber sizes used are overstated to accommodate the insulation requirements of the design. Structural timbers to width and thickness but not necessarily finished length are transported to the building site where they are used either to make Internal or External Panels or used as ground, midfloor or roofing joists and timbers. As discussed earlier the cutting and assembling of timbers on the building site is a time consuming and inefficient use of manpower when compared with the advantages which can be attained when processing the timber fully in the workshop.

#### **5.3.3.2 Non Structural Timbers**

Following the sawing and kiln drying process of the structural timbers the non structural timbers will either be used in their sawn state or will be machined to particular profiles for use in the finishing of the house. The equipment owned by the company is of the most basic type and will again require lengthy machine operations to achieve acceptable results.

### 5.3.3.3 Joinery Products

The company has the facilities for making only the simplest of joinery products and by virtue of the equipment available this is considered to be of poor quality. For the most part the doors and windows used in the houses have been bought in from manufacturers within the region. Whilst adequate in their performance they must also be considered poor in timber quality and finish terms.

### 5.3.3.4 Insulation Materials

The procurement of Insulation Material of an acceptable quality performance standard is a very serious problem for the company. A number of different types have been used in the construction with various degrees of success and at the time of the consultancy no acceptable solution had been found.

### 5.3.3.5 Sheet Materials

In the first 3 houses plywood has been used for both the internal and external sheathing of the wall panels and also for the ceilings, floors and roof. Plywood is an excellent structural material which has largely been replaced in North America and Europe by composite materials which can give the necessary performance qualities or higher for a lower cost e.g.:

- a) External Sheathing - Normally plywood but bitumen based fibreboards and other such products are being used
- b) Roof Cladding - Normally plywood but bitumen based fibreboards are more commonly used in non structural situations
- c) Internal Sheathing - Normally plasterboard or non structural fibreboards
- d) Flooring - Normally chipboard or boards of similar reconstructed timbers, plywood is an alternative.

Whilst plywood can be considered an acceptable but more expensive alternative for the majority of the applications described above the use for which it is least appropriate is internal walls and ceilings where the desired effect is a plaster finish for painting or papering. In North America and Europe this effect is achieved with sheet materials having a smooth finish and whose joints can be filled and sanded to produce large flat surfaces of ceiling or wall size. The most common material for this is plasterboard which can be cut and worked easily and any joints, nail holes etc. quickly and effectively filled to achieve the desired effect. It also has the advantage that being an inert material there is little possibility of movement in later years to detract from the desired finish. Plywood on the other hand is more difficult to work with and is always susceptible to small changes in moisture content resulting in movement.



The company has however been unable to source either plasterboard or another suitable alternative to plywood during its 3 years of existence.

#### **5.3.4 Design and Structural Requirement**

At the time that the Canadian Consultants worked in the company they introduced 3 house types of typical North American Design and size. The houses were then engineered to ensure that they met the requirements of the region in terms of Earthquake Factor and Insulation Value.

At the time of the UNIDO consultant's visit no drawings were available to indicate that the company had attempted to design houses which would reflect "Russian Taste" either in style or size. Nor was there any evidence to suggest that the company had carried out any development work in this area.

#### **5.3.5 Sales and Marketing**

In the 3 years since its entry into Timber Framed Houses Creal has at March 1995 built and sold 2 houses and is presently completing the third as yet unsold. Discussions with the management would suggest that discussions are under way with a potential client in Irkutsk for one house and there are tentative proposals to build 10 houses on a speculative basis also in Irkutsk. The company has also received a tentative enquiry from China for panels without sheathing or insulation but the economics of shipping structural elements without the added value products must be examined carefully. In the meantime the company is engaged on building repair work on traditional housing in Baikalsk.

Discussions with the management of the company as to the reasons for the poor performance would indicate that Timber Framed Houses are still considered to be unproven technology and the lack of solid brick or concrete walls a psychological barrier to those Russians with money to spend who consider "wooden" houses to be structures without substance. This view was confirmed by the Chief Architect of the region Professor V.V. Iskarov who as a believer in Timber Framed Houses suggests it will be a long time before the prejudices can be eradicated.

It should also be noted that the majority of new houses are self built and that in the absence of Mortgages and Bank Loans at acceptable rates (20% plus per month being the norm) the house builder will normally buy materials for his house on a piece meal basis as and when he has funds. The rate of inflation also plays an important part as any disposable income will be spent as quickly as possible to avoid the problems of devaluation. This approach is well suited to brick built houses as the materials can be bought as and when needed and the building programme spaced out over a 2 or 3 year period. Whereas the idea of Timber Framed Houses is that the total package is ordered, paid for and delivered to enable the house to be built in a matter of weeks. The problem

for the purchaser of a Timber Framed House is that if he has to find the total sum of money in a short space of time, either by saving or borrowing, any savings he might have expected by building a Timber Framed House are negated either by devaluation or interest charges.

Analysis by the Chief Architects Department shows that there are currently 24000 houses projected for the region of which some 8000 are presently being built. It is the view of the Chief Architect that Timber Framed Houses currently represent less than 1% of this total and that of the 750 new house starts in 1995, less than 40 will be Timber Framed Houses.

### **5.3.6 Regulatory Bodies**

Given that the country has no real experience of private home ownership in this century, the legislation governing the building of such properties is considered to be inadequate by the Chief Architect of the region. Such experience as there is, is related primarily to the building of cottages (Dachas) in kitchen gardens and it is this experience which has been transferred to the building of more substantial properties.

The results of this approach can now be seen throughout Russia. In essence land is identified as suitable for building, and agreement reached with the local authorities on its purchase. It is then the responsibility of the land owners to arrange and pay for the servicing of the site, roads, drainage, electricity etc. However, there would appear to be no legislation in place which ensures that this work will be carried out beyond small fines which can be imposed on a once only basis. As a consequence the house owner puts his money and energy into building the house first.

This generally results in a field of partially finished houses all of which appear to have concentrated on volume for money with little or no consideration for the design of the house as an individual unit or for the overall aesthetics of the development. These houses are built without roads, sewerage disposal or heat and electrical supply until such time as all the owners are prepared to pay their portion of the servicing costs. In the absence of any legislation to ensure that the owners will pay their share it is highly unlikely that the sites will be completed fully for many years to come or until such time as the necessary authority to ensure that this work is carried out is given to the appropriate Government department.

This lack of control over the house building industry in general, both in terms of planning permission and aesthetic control, together with the lack of Building Regulations or their enforcement must inhibit the development and acceptance of Timber Framed Houses in the Irkutsk region and Russia in general.

### **5.3.7 Comment**

The company whilst taking a progressive step by entering into the manufacture of Timber Framed Houses has made no significant progress in the 3 years of its operations in this area.

The manufacturing unit occupied by the company is inadequate for the commercial manufacture of Timber Framed Houses.

The equipment operated by the company is inadequate for the commercial manufacture of Timber Framed Houses. The quality standard achieved by the company for a full build house are acceptable but the time scale of building and reparation work is unacceptable for the commercial manufacture and building of Timber Framed Houses.

The company does not have the capability of supplying Timber Framed House Kits to self build customers.

The company's inability to source insulation and suitable inner wall and ceiling sheathing materials is a serious problem which has not been addressed with any degree of success.

In 3 years the company has relied solely on the 3 original Canadian House Styles to promote Timber Framed Houses. The lack of success has been attributed to the "psychological barrier" of brick versus timber. Whilst this may be true the company might have been better advised to design and build a smaller house in the regional style to see if this were more acceptable to the public.

This approach might also have helped with the financial problems of building large houses in a short space of time. The lack of rules and regulations relevant to house building has meant that the population has had to rely on experience (or the claims of the Timber Framed House Manufacturer) when making a decision as to which method of housebuilding to use and it is perhaps natural that brick has taken a precedence over Timber Framed Houses.

The company must continue to lobby the authorities for the introduction / changes in housebuilding legislation if it is to build houses on a commercial scale.

### **6.0 Proposed Mechanical Wood Processing**

The company has received a number of project proposals to aid the further diversification of the company. Of these sawmilling and sawn log houses are those currently being reviewed.

## **6.1 Sawmilling**

The company has received a number of proposals for sawmills during the past 2 to 3 years of these two will be discussed in general terms.

### **6.1.1 Canadian Morbark**

This company made proposals in March 1994 for 3 separate sawmilling operations:

- Kiln Drying
- Sawmilling
- Planer Line

#### **6.1.1.1 Kiln Drying**

The company's proposal is for a Moores International drying kiln supposedly capable of drying 75000 m<sup>3</sup> of timber per year from green to 15-20 % m.c. at an average thickness of 44 mm. On this basis of information supplied the kiln will be required to process some 450 m<sup>3</sup> every 2.25 days of a calendar year. It is the view of the consultant that these figures require confirmation as a 2.25 day cycle time (without allowance for kiln down time) is a very short time in which to dry 44 mm timber significantly without degrade. Particularly as the proposal includes for the drying of Birch (Hardwood). It should also be noted that the proposal is for a final m.c. of 15 - 20% which whilst acceptable for joinery production is unacceptable for the production of furniture which requires a m.c. of 8 to 10%.

It is the consultant's experience of drying timber in Russia that Pine will require in the order of 5 days and Birch 12 - 15 days drying time from green in order to achieve these figures without degrade.

Air drying would undoubtedly assist in the reduction of the kiln time but the company will have to exercise caution in the summer months as pine left in a high temperature high moisture content condition for 4 to 5 days will develop "Blue Stain" which whilst not causing structural degrade does give rise to aesthetic degrade of furniture which is to be stained rather than painted.

#### **6.1.1.2 Sawmill**

The sawmill proposed is of Morbark's own manufacture and is for a traditional American/Western European line using circular saws as opposed to bandsaws. The technology is well know and proven and the equipment has been inspected by representatives of the company who have expressed satisfaction with its performance.

The mill has a manufacturers rated output of 150,000 m<sup>3</sup> p.a. and will employ in the order of 20 men per shift on a 2 shift basis.

Preliminary calculations by the consultant would suggest that these output figures are optimistic given that the company intends to produce furniture stock on the machine the average thickness of which is liable to be in the order of 25 mm rather than the 44 mm thickness used by the company thereby increasing the sawing time by up to 30%.

A simple calculation using the company's average log size of 1.50 m<sup>3</sup> per 6.0 metre log would show that the mill is required to process 100,000 logs p.a. which equates to one log every 1.62 minutes on a 2 shift basis working 240 days per year. It is the consultant's view that this is not possible using a headrig with a single saw system.

#### **6.1.1.3 Planer**

The machine proposed is a heavy duty planer with a manufacturers rated output of 75,000 m<sup>3</sup> p.a. on two shifts. Whilst the consultant has no comment to make on the output of the machine it should be pointed out that the product from this machine will be square dressed timber for the construction industry of generally large dimension and indeterminate machining quality.

#### **6.1.2 Worster & Dietz**

The quotation from this company is dated 11.12.91 and comprises a fully automated production line operated ostensibly by one man per shift although the consultant's view is that 10 men per shift is probably the more likely number.

This mill is designed to be set up and run for long periods of time on logs of the same diameter. Timber of this type is more commonly found in second and third generation forests which have been planted and harvested as a rotational crop. The general situation in Russia is that the trees being harvested are from virgin forests and are therefore variable in diameter and quality and it is for this reason that the consultant does not consider this quotation to be relevant to the company's operations.

#### **6.1.3 Comment**

It is the consultant's belief that the company needs to redefine the specification of the logs to be sawn and the end uses of the product to be produced. This criteria should then be submitted to a number of companies with a request that they produce all the calculations on which they have based their quotation.

## **6.2 Log Housing**

The company has begun to explore the possibility of manufacturing Log Housing. No information was available to the consultant on which to form an opinion. Nor was there any information available regarding the demand or otherwise for such a product.

### **6.2.1 Comment**

It is the consultant's opinion that the company should avoid diversification into this area until such time as it has made a policy decision regarding Timber Framed Houses in general.