Aspen Shingles and Shakes in Alberta

Foal Enterprises Inc[1]

1987

This is a joint publication of Forestry Canada
and the Alberta Forest Service pursuant to the
Canada-Alberta Forest Resource Development Agreement

[1]Surrey, B.C.

Project # T1B42-22

DISCLAIMER

The study on which this report is based was funded in part under the Canada/Alberta Forest Resource Development Agreement.

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Catalogue No.: **FO 42-91/21-1988E**
ISBN: **0-662-15945-4**

Additional copies for this publication are available at no charge from:

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ACKNOWLEDGEMENT

Foal Enterprise Inc. wishes to acknowledge the valuable contribution and co-operation of Maritime Group (Canada) Inc., the Regional Economic Development office in Lac La Biche and Aspen Mills Ltd.

SUMMARY

The production of shingles and shakes from aspen has been demonstrated at a number of places. The results of this study are in full agreement with this technical feasibility and which concluded that a viable shingle/shake operation could be set up around Lac La Biche area provided the market economics would be favorable as well. Prior to establishing a mill for the production of aspen shakes and shingles, it is recommended that a detailed business plan be developed. Details for consideration of such a document are provided.

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ASPEN SHINGLES AND SHAKES IN ALBERTA

Introduction

Aspen roof coverings were used successfully in the northeastern part of Alberta on farm buildings and rural housing. In these applications aspen has demonstrated over 20 years of satisfactory service performance. Aspen shingles and shakes are also manufactured in Arizona, New Mexico and Colorado in the United States.

The objective of this study was to evaluate how an aspen shingle and shake manufacturing facility can be developed based on the resource quality that exists around the Lac La Biche area in Alberta.

Initial Approach

Test blocks ten inches in diameter by eighteen inches long were sawn on an identical machine as the one installed by Aspen Mills at McRae. It was a good comparison as the mill was cutting 18" taper-sawn shakes using cedar. Also, the sawyer was an experienced shingle sawyer.

The total recovery of shakes 5/8" thick by 18" long from one 10" round block was 66 lineal inches (shakes set side by side). When applied to a roof, or wall, at the standard 7 1/2" exposure they would cover 3.44 square feet of roof area.

To produce one square of shakes it would require thirty blocks 10" in diameter, or 45 lineal feet of logs. This amounts to .76 cubic meters of logs of good quality.

Based on the available cost of logs to the mill we have estimated that the wood cost would amount to $21.50 per square.

The following widths of shakes were cut from the test blocks and covered all grades:

8" wide shakes - 19.3%
7 3/4" wide shakes - 18.7%

7 1/4" wide shakes - 4.3%
6 3/4" wide shakes - 12.3%
6 1/2" wide shakes - 3.9%
6" wide shakes - 10.9%
5 1/2" wide shakes - 10%
5" wide shakes - 9%
4 1/2" wide shakes - 2.7%
4" wide shakes - 2.4%
3 1/2" wide shakes - 4.2%
3 1/4" wide shakes - 1.9%

Average width of shakes was 6.11".

The grading of the shake produced a low recovery particularly for roof application. It was somewhat better for wall application. The recovery figures are given below:

Roof shakes - 28%

Sidewall shakes - 56%

Decorator and rejects - 15%

Using the standard West Coast shingle machine that cuts 33 cedar clips (shingles) per minute for aspen would require slowing it down to 26 clips per minute to get a smoother cut, as aspen tends to choke the gullets of the shingle machine.

Actual shingles produced per minute with aspen would amount to 19 clips with good wood and a fast operator. This also takes into account the production time lost when the blocks are being placed into the machine. The 19 clips is considered an average over a given period of time.

This reflects the following:

- 19 clips with an average width of 6.11" equals 116 lineal inches of shakes per minute. Per hour 116 lineal inches times 60 minutes = 6,960 lineal inches of shakes. One square of shakes contains 1,920 lineal inches of shakes. When this is carried to a per hour output the equation is 6,960 lineal inches of wood divided by 1,920 inches of wood which equals 3.62 squares. This equals twenty-seven squares per 7 1/2 hour shift. However, twenty-three to twenty-four squares per shift would be more realistic.

Taper-sawn shakes were suggested because physically there is 700 lineal inches less of wood to cut as opposed to shingles and a labour handling cost saving of 27%. The actual cut out per square between shingles and taper-sawn shakes is the same.

If shingles were considered, the daily production of shingles would be 2.6 squares in a 7 1/2 hour shift, which equals 19.15 squares per day.

On the West Coast daily production is about 35 squares and is about 80% No. 1 Grade.

Western Red Cedar lends itself well to cutting shingles or taper-sawn shakes in an upright shingle machine, as it cuts very smooth. However, aspen tends to be fuzzy on one face of the shake.

By passing the shakes through a groover this will eliminate the fuzzy appearance and also give the shakes a split like texture which will improve the exthetics and also dramatically improve the performance of the shakes as the grooves will tend to channel the water straight down to the butt of the shake. It should be noted that when shingles or shakes are cut on a circular type saw, and the face tneds to have saw marks on it, the tendency is for the water to follow those saw marks to the edge of the shake.

Cross grain on an upright shingle machine also can become a problem. Cross grain shingles and shakes is defined as such: "Means a pattern in which the fiber or longitudinal elements deviate from a line parallel to the (face) side of the piece. In shingles it is the angle of grain extending from the face to the back".

Cost of Required Equipment

To operate an upright shingle machine and to further process the shakes as described above, the following equipment would be required.

1. Where adequate hydro power is not available it would require a diesel generator as most equipment comes standard with electric motors, generally 440 volts, three phase. This is important because the speed of saws must be maintained very accurately as they have been hammered to a given rpm and their cutting spped is extremely important. Often belt driven equipment operating

from a straight diesel engine can cause considerable variations in actual machine cutting speed. The cost of a good used diesel generator would be in the neighborhood of $6,000.

2. Groover $12,000.

3. A slash deck with circular saw to cut logs to an accurate block length - $12,000.

4. Other support equipment - $8,000.

5. Automatic grinding equipment - $3,600.

6. Swedge and shaper - $1,000.

Total of equipment is $42,600.

Alternate Approach

It is our suggestion that an alternate procedure be used to manufacture high quality shakes with the least requirement of skilled labour.

In considering a viable shake operation the two species - lodgepole pine and tamarack should be considered as they are both excellent species for wood roofing and sidewall material.

The concept that we are proposing here is considerably different from the standard approach to the manufacture of shingles and shakes, however when related to cost of equipment, wood supply, and labour requirements amortized over the increased daily production, we feel that it is worth considering.

We envision the following production facility:

1. Logs are harvested and brought to the mill. Length of logs to be determined by:

   (a) Multiples of end products.

   (b) The ideal log length to harvest.

2. At the mill the logs are cut into the desired lengths, depending on the end product.

3. The Mighty-Mite concept of the log lying on a bed and the saws horizontally cutting a board at each pass is ideally suited to this concept, as the waste produced by tree squaring will be eliminated.

   The equipment required here can be especially designed so that as the saws pass through each board, it will not only be cut for thickness, but will also be edge-trimmed by the moveable saws giving the maximum yield for each board down to a fraction of an inch. This is a two man operation.

4. At this point full length boards that will not make shakes can be pulled and sold for other end uses.

   Boards that have defects in them that cannot be used for shakes will have to be evaluated to determine if the defects can be cut out for maximum recovery, or whether the boards should be pulled.

5. Boards are then passed through a trim saw that will cut them to the desired length. Also, at this point, if a large knot or other defect occurs in an otherwise good board these defects can be cut out.

6. The short boards, or blanks as they are called, then pass through a band saw and produce two uniform shakes. With an automatic feed no operator is required.

7. The taper-sawn shakes are then passed through a groover that will give one face a textured split-like look. The finished product is then bundled and ready for shipment.

Recovery

From one thousand board feet of sawn lumber, one inch thick, the following can be obtained:

1. 3/4" butt - 1/8" tip x 18" Long

   - 1,000 square feet of boards, 1 inch thick
   - 1,333 pieces with an average width of 6 inches
   - 16,000 lineal inches of finished shakes (laid side by side)
   - 33 bundles of shakes, each containing 480 lineal inches of wood, or 8.3 squares. Four bundles per square, a square represents enough shakes to cover 100 square feet of roofed area at a 7 1/2" exposure.

2. 3/4" butt - 1/8" tip x 24" Long

- 1,000 square feet of boards 1" thick.
- 1,000 pieces with an average width of 6".
- 12,000 lineal inches of finished shakes.
- 41.66 bundles each containing 288 lineal inches of wood, or 8.3 squares. Five bundles per square, a square represents enough shakes to cover 100 square feet of roofed area at a 10" exposure.

Thirty-five (35) cubic meters of good logs will produce approximately 21 cubic meters of lumber using a 60% recovery factor. This amounts to 8904 board feet of lumber, 1" thick. Cost of lumber will have to be determined from log costs.

Operating Costs Model

The figures will have to be determined and should be based on a production of 60 squares per day which is the capacity of the automatic resaw.

Local Alberta costs should be inserted where applicable in the model.

OVERHEAD EXPENSES	Per Square
Amortizing of mill equipment, $60,000 approx. installed - $60,000 - $180. = 334 operating days	$ 3.00
Insurance Office supplies Accounting Depreciation Travel expenses, local Telephone, etc. Purchase forklift or lease	Needs to be determined
Sub-Total	

MANUFACTURING COSTS	
Labour - No. of men x 7 1/2 hours working W.C.B. U.I.C. and C.P.P.	Needs to be determined

Power Gas and oil First aid supplies Saw replacements Banding Clips Band sticks Miscellaneous Maintenance and repair	Needs to be determined	
	Sub-Total	
WARNOCK HERSEY PROFESSIONAL SERVICES LTD.		
Quality Control Program		$ .42
SUPERVISION, CONSULTING, ETC.		$ 3.00
RAW MATERIALS		
	Sub-Total	
	TOTAL	

The above numbers have to be filled in with the cost for local production. They will have to be calculated by the mill operator. However, if you require some assistance we can make some relative comparisons to West Coast costs.

Cost of Mill Equipment

1.	Gang saw - will cut an entire log up to 14" in diameter into 1" boards in a single pass:	
	Circular saws with insert teeth	$15,000.
	Automatic feed and tail tables, if required	6,000.
2.	Circular saw edger with three moveable saws	6,500.

3.	Automatic trim saw with four adjustable saws	$ 6,000.
4.	Air compressor for trim saw	700.
5.	Band resaw	6,400.
6.	Automatic feed for band resaw	3,000.
7.	Groover	12,000.
8.	Packing frames	500.
9.	Support equipment	8,000.
		$64,100.

The above costs are approximate and do not include a power source, whether it be Hydro or 90 KVC diesel generator.

All equipment is new or specially rebuilt and modified for this specific operation.

Wiring is not included, nor transportation to the site.

The manufacturer of the equipment will help set it up and fine tune if for a cost of approximately $3,000.

Conclusions and Recommendations

To obtain a production rate of 60 squares per day, which is the capacity of the resaw, it would require a supply of 7,500 to 8,000 board feet to the resaw.

The key points here are:

1. Greater end production.

2. The finished boards can be graded prior to being cut into short boards or blanks and entering the resaw.

   Low grade boards can be culled for other end uses or can be trimmed prior to resawing. It must be noted that regardless

of the quality of the board that goes through to produce the end shake, it still requires feeding time and is a negative cost.

3. One inch boards can either be supplied by other producers or other equipment, and be brought in to offset any shortage of material produced within the mill.

This type of operation also has some other side benefits in that in a period of low demand for the end product, the mill can operate one day cutting the required number of boards to feed the mill and the following day run them through to produce shakes. This would essentially reduce the manpower required, the amount of raw material required for the mill and in addition the average output could still be kept at 30 squares per day which would still be in excess of the standard shingle machine.

Prior to establishing a manufacturing facility it is recommended that a proper busines plan be developed. A detailed outline of such a document is given below.

Suggested Business Plan Outline

Executive Summary

Introduction-

In today's market place species other than western red cedar are gaining increased acceptability as wall and roof cladding.

Availability, cost and durability of aspen are the key factors in its acceptance and use. Quality of available wood, end products produced, and the use of a preservative treatment can have a very significant affect on the viability of aspen shingle and shake production.

Points for General Consideration

1. Wood supply:
   - quantity

- quality
- cost at the mill
- availability
- proximity to the mill

2. Will the wood be delivered to the mill in block or log form?

3. Sorting of the wood for end use.

4. Market demand for products that:
   - Have a price advantage.
   - Have an end user appeal and/or preference.
   - Are not presently being catered to by the cedar industry.
   - Can be developed into new products that are unique to aspen.

5. Production machinery that is presently available and at an acceptable cost.

6. Available manpower, both skilled and unskilled (rate of pay and benefits are crucial when related to production).

7. Marketing is a very important consideration and must be addressed in the following:
   (a) The tarrif advantage gained from using non-cedar species should be considered.
   (b) Is the target market going to be in direct competition with cedar?
   (c) Is there, or can there be a whole new market developed for aspen shingles and shakes.
      - Sidewall market.
      - Designer shingles (decorator).
      - Will white color be desired in countries such as Japan?
      - Treatment that gives market advantages.
      - Profiles and textures that give a market advantage in the market place.
   (d) Specialty items of aspen shingles and shakes should be considered as an alternative to panelling and should be marketed as such and displayed in the same manner and kept away from cedar and other roofing.
   (e) End markets have to be chosen that have the closest contact to the end user (retail chains, etc.).
   (f) Promotional literature has to be considered and should consist of:
      - Blue sky, four colors, to entice the buyer.
      - Simple detailed instructions on the application and hints that will help the novice to a good job.
   (g) The do-it-yourself market is the largest growing market and should be a major consideration.

      1. The average disposable income is higher today.

2. The number of homes that have been built years ago have appreciated in value and leaves the owner with a number of options.
   - In today's economy existing mortgage payments are low.
   - Our home is outdated and do we move up to a newer home and a bigger mortgage?
   - Will our children soon be leaving home?
   - We are well established in the neighborhood and this is where all our friends live.
   - Can we upgrade our present home by remodelling?
   - If I can do it myself I only have the cost of the product and not the labour.
   - I have more time and knowledge available to undertake projects and show my creativity.
3. The remodelling market is an ideal target area:
   (a) The cost is in material only.
   (b) End use ideas are important.
   (c) Detailed applicaiton information is required.

Production

The production of aspen shingles and shakes can only be undertaken where market potential and wood supply are high and the cost of production low.

Production costs must be determined before entrance into the market place can be considered.

Production Costs:

To determine production costs, high and low production output must be established and all fixed costs must be amortized over these two production levels. In addition, a mill normally only operates about nine months of the year because of weather, holidays, downtime, fire season, etc.

Cost:

Raw Material

Cost of trimmed usable material at the mill deck.

Manufacturing Cost

1. Labour, number of employees times rate of pay.
2. Taxes on manufactured products.
3. W.C.B. based on wages.
4. Power - electric/diesel
5. Band sticks.
6. Band strap and clips.
7. Miscellaneous supplies.
8. Maintenance and repairs.
9. Accounting
10. Telephone
11. Insurance
12. Office supplies
13. Labels
14. Bank interest
15. Supervision
16. Gas and oil for yard equipment.
17. Depreciation
18. Treatment that may be required.
19. Quality control (inspection).
20. Pallets

Production

The following end products have the potential to be manufactured out of aspen. However, cost must be evaluated relative to the rate of return on the end product.

A length of 18" should be selected as it would give the best cut out from the log; and blocks not suitable for one product can be used for another type of product.

Also, an 18" shake has less exposure to the weather and as a result will perform better by resisting warping and splitting.

24" shake lengths could be considered for production, provided the wood supply is available and the market demands it.

SHAKES:

Taper sawn shakes are a first choice. They should be 18" long, with a butt thickness of approximately 3/4" and a tip thickness of 3/16".

These shakes can then be textured to give the appearance of a split shake. The following pros and cons have to be addressed:

1. Percentage volume of raw wood that lends itself to producing taper-sawn shakes of roof quality.

2. Grades have to be established that meet the present market demand and provide a marketable product for the fall down, or lesser grades that are developed.

   An outline of grades could be designated in relation to end use and instead of using the Standard Nos. 1, 2 and 3 grade, each type and quality should have a distinctive name that identifies the end use and at the same time has a marketing appeal. Such as:

   A.
   No. 1 Roofing Grade could be called "Alberta Shakes". They would be:
   - 100 % clear.
   - Textured to look like split shakes, yet have the advantage of the easy laying of shingles.
   - Treatment would give improved dimentional stability, resistance to warping and increased resistance to decay.
   - Treatment could be tinted to give the color appearance of cedar ("Alberta Cedar").

   B.
   No. 2 Grade could be called "Cottage Shakes". Ideally suited for use on cottages and all types of secondary buildings. Also this would be the ideal cladding for use as a sidewall material.

   A general specification would be as follows:
   - Tight knots and other minor defects permitted in the upper third of the shake.
   - Shakes should be made available.
     (i) Natural grooved.
     (ii) Tinted grooved.
     (iii) Both treated and untreated should be made available. However, note: untreated aspen that has not been properly dried and kept dry will discolor very badly. Anti-stain would be required for green aspen.
   - Very easy to follow guide lines and instructions must be provided to ensure a correct application and end user satisfaction.

C.
Decorator grade:

This could follow into two groups:
(i) RUSTIC GRADE:

This would permit some of the characteristics of the species in the lower portion of the shake to show and should be used as suggested as a decorative panelling where exposure to the weather is not a factor.

(ii) RANCH GRADE:

This would permit some of the more dramatic characteristics of the species to show and would be used where a very rugged effect is desired.

To produce the above the following machinery is required:

1. Log deck to cut the desired length of block. If blocks are harvested in the wood the following can occur:

   (a) End checking of the wood.
   (b) Varying lengths of block, depending on the bucker.
   (c) Loss of moisture that can affect the retention of treatment.
   (d) If block cutting is done at the mill site, selection of logs can be made relative to the order file.
   (e) Transportation of full logs tends to be more economical.
   (f) Harvested logs that do not lend themselves to shingle/shake production can be marketed to producers of pallets, lumber, etc.

2. Upright shingle machine which is in place.

3. Groover or profiling machine that puts the split texture to the face of the taper-sawn shake and gives the following advantages:

   (a) It produces a desireable split face texture that increases the market potential.
   (b) At the same time that it retains the desirable texture of the split shake, it has the ease of application of a sawn shingle.
   (c) Aspen as a species when sawn on an upright shingle machine tends to develop a fuzzy surface on some shakes. Texturing of the surface of the shakes will improve the surface appearance.
   (d) Many of the characteristics of aspen will be enhanced throughout the grooving process.

(e) Cost of the machine, approximately $12,000 which includes motors and drives.

4. TESTING EQUIPMENT

This would require a simple device that would keep the shingle/shake submerged for the required time and be geared to the production flow. Design of which can be easily developed when volume or production and dip times are known.

A mill flow pattern would be as follows:

1. Logs at the mill are cut to length and sorted as to end use.

2. The sorted blocks are put on specially designed pallets so that specific blocks, relative to production, can be supplied to the machine at one time.

3. Pallets of blocks are delivered to the shingle machine to produce the product that the machine has been set for.

4. At the groover the feeder selects the best face to be textured and discards shakes that do not warrant texturing (a little practise will achieve a high degree of competance).

5. From the groover the shakes should go through the dip treatment. At the end of the dip treatment a period of time must be provided so excess preservative can be drained. This could be easily determined in the material flow schematic.

6. Final grading and packaging is done at this point. One packing frame can handle the entire production of one shingle saw if it is handled correctly as follows:

   - Treated product is dropped on to a turn table where the packer can select and pack according to the type/grade. With a little skill and practice he will be able to carefully judge the grade of the product on the turn table and know what his next bundle should comprise, in terms of quality/grade.

7. After the bundles have been compressed, a short drip off facility should be provided.

8. Palletizing and preparation for shipment. The following has to be determined:

   (a) Outside storage
   (b) Shed storage
   (c) Outside storage with plastic hood

(d) Inside storage with plastic hoods applies at time of shipment to keep the product clean while in storage at a dealer's yard.
(e) Storage time in the producers yard. Stored product has to be properly looked after to prevent deterioration, and a poor appearance of the product resulting from weathering.
(f) Some consideration should be given to create an attractive pallet wrap that advertises the product on it's entire journey from the producer to the end user.

DECORATOR SHINGLES

Decorator shingles can be produced on the same shingle machine as the shakes, only adjustment is on the butt thickness.

Decorative shingles cover a wide spectrum of shingle products. A general separation would be as follows:

1. DESIGNER SHINGLES:

These are shingles that are dimensional to a 5 inch width and have the butts profiled to specific decorative patterns.

They can be marketed in several grades or charateristic textures.

They would require the following consideration:

(a) Special equipment is required and suggest that you work with someone like All Canadian Cedar Corp., of Surrey, B.C., that has the equipment and technology in place.
(b) A small kiln would be required to dry the shingles.
(c) Decorative cartons would be required for attractive marketing.
(d) Marketing aids would be required such as display fixtures and sample displays.

2. DECORATOR SHINGLES

Decorator shingles could have very good market potential if you consider the following:

(a) Shingles can be produced in random widths to gain the optimum log recovery.
(b) White shingles can be separated for markets such as Japan.
(c) Fall downs when treated can be sold as decorative shingles which in aspen can be very attractive.

(d) The groover can be fitted with straight knives to produce a planed look.
(e) Kiln-drying would be required.
(f) All the shingle production could be marketed.

SUMMARY

All decisions regarding product production and marketing have been outlined in the above notes, however, they must be related to the varying factors that exist. In point form they are as follows:

1. Raw material.
2. Potential product development.
3. Capital outlay in plant equipment.
4. Marketing expenditure re: packaging and back up.
5. Skill of production people available.
6. Attributes of the treatment.
7. Ridged quality control provided by an outside agency.
8. A blue print of the treatment and claims must be provided to a certifying organization to ensure that quality control and concentration of the treatment has not deteriorated.

The next stage of this study requires:

1. A close look at the raw material supply.
2. Machinery and other equipment required.
3. Optimum product recovery.
4. Treatment attributes:
   (a) Stability.
   (b) Preservation aspect.
   (c) Fire retardancy.
   (d) Color enhancement of the end product.

5. To complete the final stages of this report requires a trip to Alberta and the following are required:

   (a) A report on wood supply based on size, quantity, and location (Alberta Government).

   (b) A trial run of shingles and shakes that should be based on:
      1. One cord of wood that is representative of the better quality of logs (large trees).
      2. One cord of wood that is representative of marginal wood that could be considered for shingle and shake production.

(c) The potential of cutting the larger logs on a head rig that would take a large cant off one side and leave a center flitch that would be exactly 5" wide.

The rational being that the center cant can then be cut to the required length and several blocks can be place in the shingle machine side by side, increasing production and eliminating edge clipping when producing designer shingle blanks.

The edge cants can be cut to length and place in the shingle carriage to obtain the best recovery of the wood and grain off the maximum width.

(d) Treatment:

We need data on the treatment or we could have some relatively inexpensive tests done a Warnock Hersey Professional Services Ltd., Coquitlam, B.C. Also, we need a blue print to ensure proper retention of the chemicals.

(e) To what degree would the Alberta Government support the project?

(f) Based on a nine month year, which is a yard stick that all operations are based on for survival, what affect will summer supply of wood and winter conditions affect treatment?

(g) Can the operation be contained in a building that can be heated above freezing during the winter by burning the waste product generated by the operation?

(h) Can the clean edge clippings, etc., be packaged and marketed as kindling in such outlets as supermarkets, service stations, etc.