

ECONOMIC OPPORTUNITY ANALYSIS FOR DEVELOPING AN IN-KILN MOISTURE METER

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Objective

Compare cost estimates for developing an in-kiln moisture measuring system with the benefits expected from it by reducing overdrying degrade in a lumber kiln-drying operation.

Rationale

No reliable in-kiln meter exists to measure the target moisture content. In high-speed softwood drying, occasional overdrying causes lumber value losses due to degrade.

Project Assumptions

- Every sixth kiln load is presently overdried by 3% MC^{2/}. Then, overdrying per charge with no moisture meter is $1/6 \times 3\% \text{ MC} = 0.5\% \text{ MC}$.
- In 9 out of 10 cases, the potential in-kiln moisture meter performs within a specified $\pm 1.5\% \text{ MC}$ tolerance range. 50% of all loads will be overdried by about 0.6% MC as an average, and 50% underdried by 0.6% MC (normal distribution, Figure 1). Then, overdrying per charge with moisture meter is $1/2 \times 0.6\% \text{ MC} = 0.3\% \text{ MC}$.
- Consequently, meter use will reduce overdrying from 0.5 to 0.3% MC per charge, or by 40%.
- Average kiln runs 8 million board feet of softwood lumber per year.
- Average loss due to overdrying degrade is \$4 to \$6, per kBF^{3/} and per % MC.
- Then overdrying of 8,000 kBF/year/kiln \times \$4 to \$6/kBF/% MC \times 0.5% MC overdrying rate gives loss of \$16,000 to \$24,000 per year and per kiln.
- Use of in-kiln moisture meter will recover 40% of loss, or save \$6,400 to \$9,600 per year and per kiln.
- Development costs are \$200,000.
- Implementation capital per kiln is \$5,000 to \$10,000.

Financial Assumptions

- 1 year capital spending
- 15% discount rate
- 6% cost escalation rate

¹This case study uses hypothetical data.

²MC = Moisture Content

³kBF = thousand board feet

- . 10% investment tax credit
- . Depreciation 10 years straight line
- . 50% federal income tax rate
- . No maintenance capital

Project Value	Loss Per kBF and Per % MC	
	\$4	\$6
. Expected DCF-ROI ^{4/} (Figures 2, 3)	61% to 37%	83% to 50%
. Expected NPV ^{5/} (Figure 4)	\$14,500 to \$11,300	\$23,200 to \$20,200
. Expected capital pay- back period (= Capital/ Savings)	≤ 1-1/2 years	≤ 1 year
. Implementations re- quired to pay back development costs (= Development costs/ NPV)	14 to 17	9 to 10
. Probability of success- ful development	?	?

Other Benefits

Accurate in-kiln moisture metering will lead to overall

- . Reduction of kiln residence time
 - . Less demand for kiln capacity
 - . Energy savings
 - . Manpower savings
- . Reduction of lumber brittleness and shrinkage
 - . Lumber volume savings
 - . Less planer down time
- . Reduction of safety hazards
 - . Elimination of MC checks by hand in hot kiln
- . Closer quality control

Assessment

Based on this evaluation, the economic opportunity for developing an in-kiln moisture meter appears very good.

⁴ DCF-ROI = Discounted Cash Flow - Return on Investment (= Internal Rate of Return)

⁵ NPV = Net Present Value at 15% Discount Rate

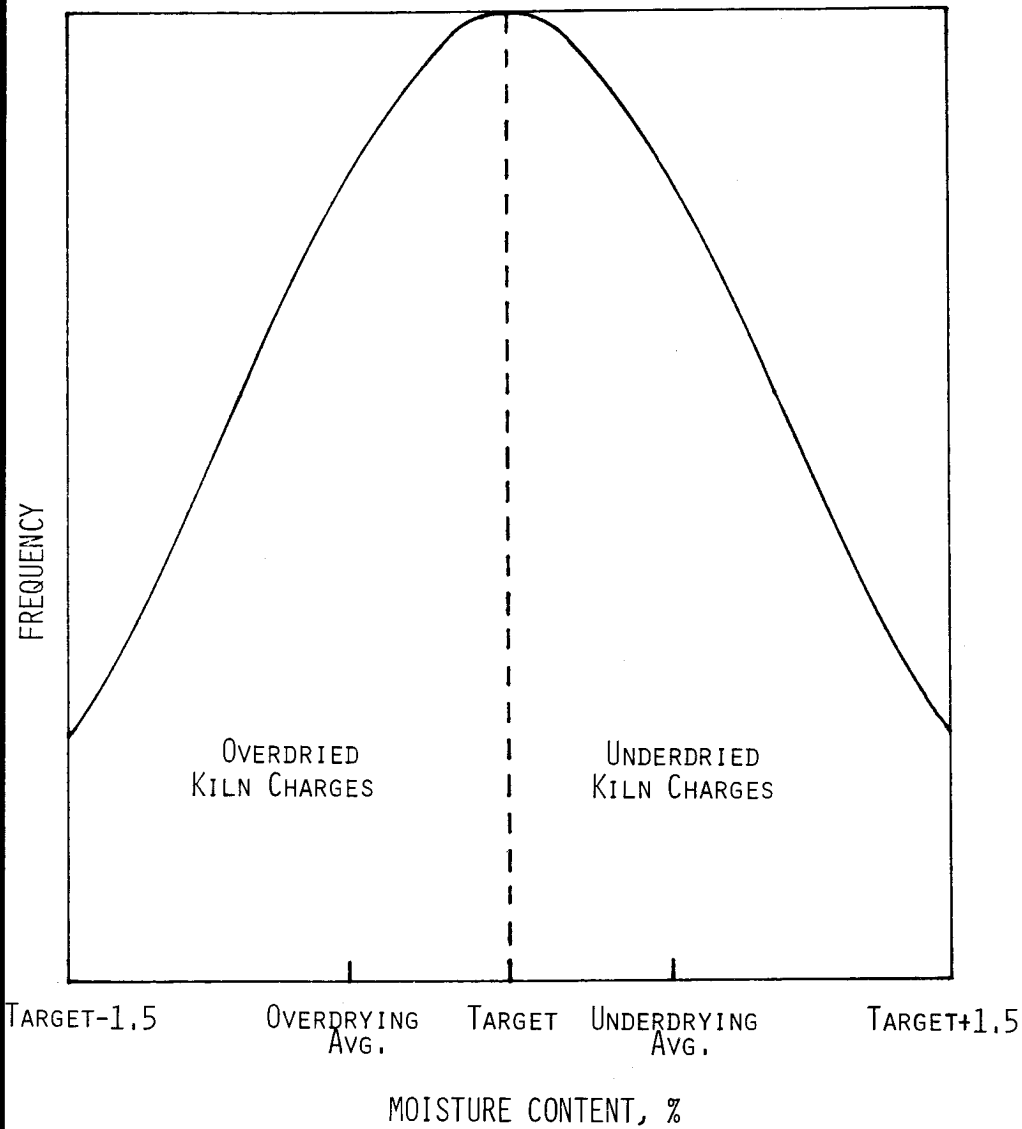


FIGURE 1 - EXPECTED FREQUENCY DISTRIBUTION OF MOISTURE CONTENT OF KILN CHARGES WHEN IN-KILN METER IS USED. (THE $\pm 1.5\%$ MC TOLERANCE INTERVAL CONTAINS 90% OF ALL OBSERVATIONS.)

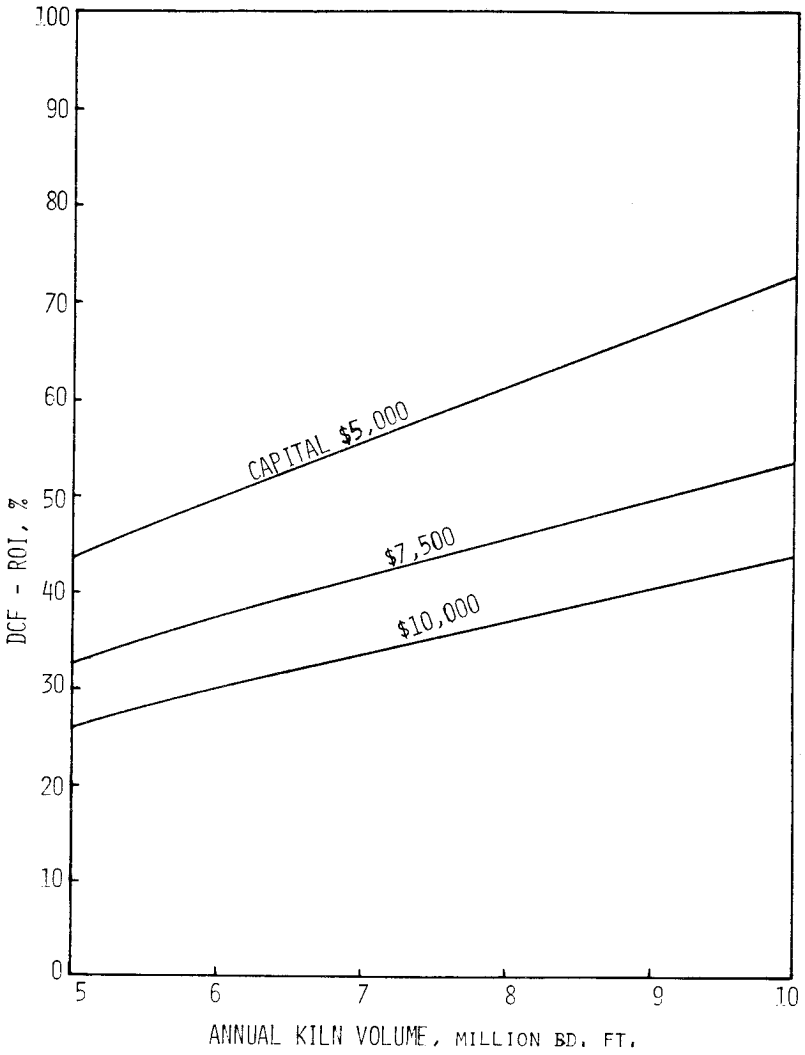


FIGURE 2 - DISCOUNTED CASH FLOW - RETURN ON INVESTMENT VS. VOLUME DRIED PER YEAR AND PER KILN WHEN LOSS DUE TO DEGRADE IS \$4 PER KBF AND PER % MC.

SOURCE: WEYERHAEUSER COMPANY

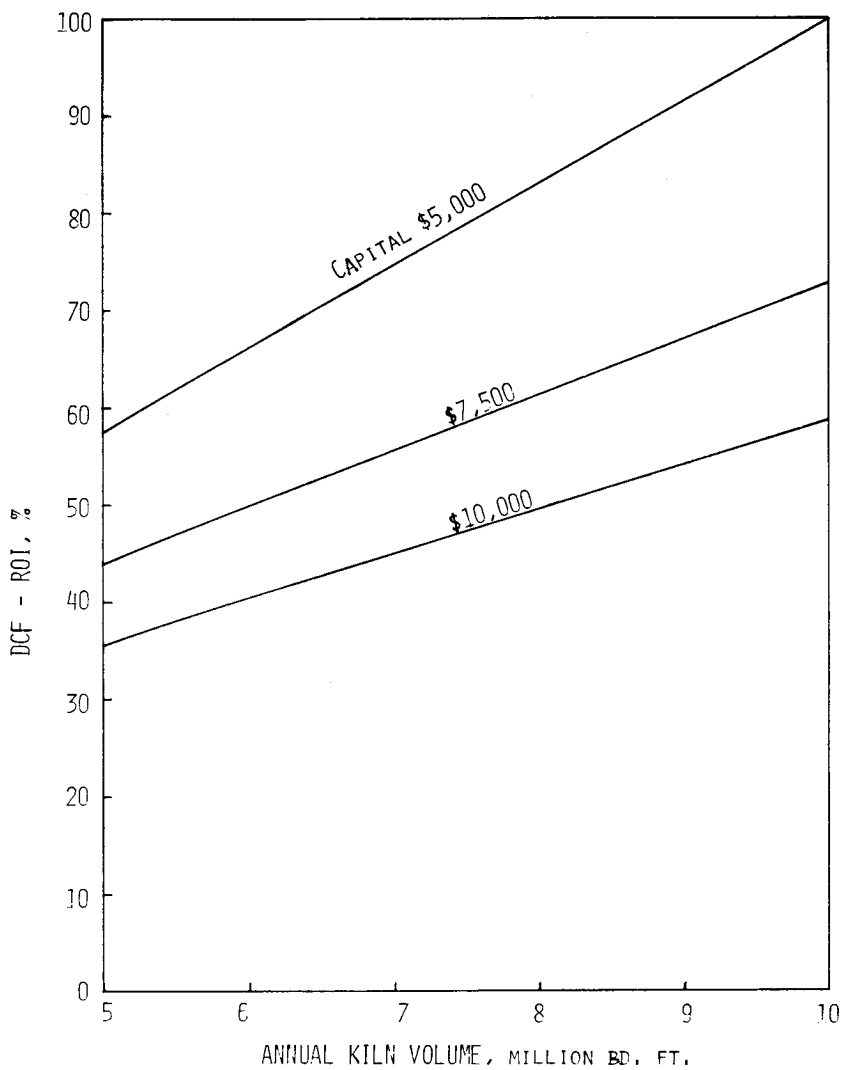


FIGURE 3 - DISCOUNTED CASH FLOW - RETURN ON INVESTMENT VS. VOLUME DRIED PER YEAR AND PER KILN WHEN LOSS DUE TO DEGRADE IS \$6 PER KBF AND PER % MC.

SOURCE: WEYERHAEUSER COMPANY

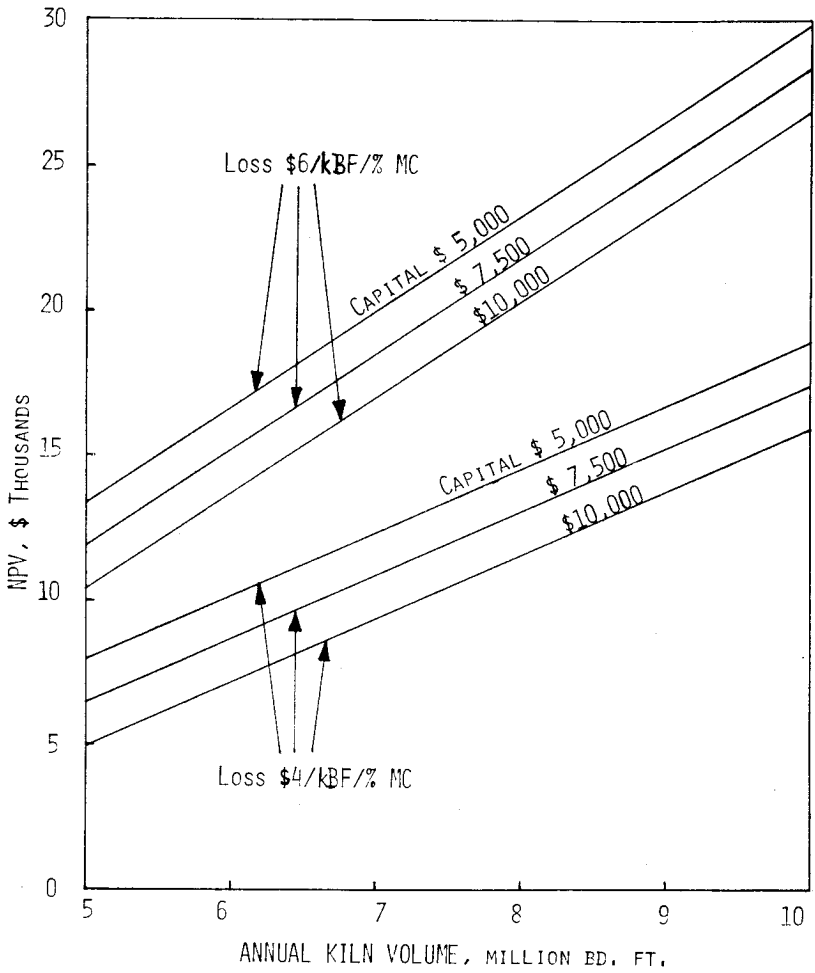


FIGURE 4 - NET PRESENT VALUE VS. VOLUME DRIED PER YEAR AND PER KILN.

SOURCE: WEYERHAEUSER COMPANY