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LEAN PRODUCTION IN A GREENFIELD MILL

a case study of 'wild rose 1'

Valerie Preston
John Holmes
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Contents

Executive Summary

The Alberta Newsprint Company mill in Whitecourt, Alberta with its state-of-the-art paper machine dubbed 'Wild Rose I' is one of the most efficient newsprint mills in North America. This paper documents the systematic drive by the Alberta Newsprint Company to achieve lean production by the use of flexible work practices in a greenfield mill which began production in 1990.

- The mill, located in a remote area of Alberta, was designed with an open layout and on one floor to facilitate communication among workers from different departments, a prerequisite for flexible labour practices and a lean production system.

- In the workforce recruitment process, more importance was placed on such criteria as work ethic, good team player, self-reliance, problem-solving skills, and motivation than on experience in the industry.

- Policies and procedures not traditional to the industry were introduced from the outset—highly integrated processes, continuous production, fewer departments, multi-skilling, cross-training, more generic job titles, blurred job demarcations, and higher than average industry wage rates.

- The absence of traditional and restrictive work practices allowed the flexibility to use multi-skilling, cross-training, teamwork, and overtime to achieve continuous production and overcome problems such as absenteeism, sick leave, and equipment breakdowns.

- The initial wage policy established not only occupational wage differentials, traditional in the industry, but also a pay-for-knowledge system and an annual bonus for all employees based on productivity.

- The company uses a number of 'distancing' strategies for ancillary functions that take advantage of the local labour market and reduce the size of the directly employed workforce. These functions are subcontracted to nonunionized independent operators or to other companies.

- An employee survey indicated that job satisfaction is high. However, the wage structure and the pay-for-knowledge system have created some tension. Production workers were receiving higher wages than trades people, which was not the tradition in the area. In addition, because of the remoteness of the area, tradesworkers had limited access to training centres to acquire or upgrade skills, and thus, participate in the pay-for-knowledge system. A wage restructuring committee of hourly workers and management was established to recommend adjustments to the occupational pay differentials and improvements in the opportunity for pay-for-knowledge. This was to be achieved in a 'revenue neutral' way.

- The Alberta Newsprint Company experience demonstrates that it is possible for a Canadian mill to achieve levels of world competitive efficiency.

Introduction

Apart from the name, there is nothing nostalgic about working with 'Wild Rose I.' The well trained and well educated workforce who work on this state-of-the-art newsprint machine operated by the Alberta Newsprint Company (ANC) in Whitecourt, Alberta is pioneering lean production in the Canadian pulp and paper industry. It is among the most cost competitive newsprint mills in North America and one of the few Canadian mills that is able to match the competitive standards set by mills in the southern United States. The ANC mill combines very high rates of labour productivity as a result of the adoption of many of the work organization practices of lean production with the highest average hourly wage rates of any mill in Canada.

An all-encompassing model that combines diverse elements of Japanese management practice, lean production is characterized by its minimalist approach to factory management (Babson 1995, 6). According to Womack, Jones and Roos (1990, 13), who first coined the term in the context of the automobile industry, 'lean production is "lean" because it uses less of everything compared with mass production—half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time.' Furthermore they assert that what makes these results especially noteworthy is that the lean production system, as it maximizes productivity and quality, also humanizes the work process.[1]

Under lean production, indirect labour is pared to a minimum and specialized job classifications are reduced or eliminated to be replaced by teams.

Work organization is much more flexible under lean production. Indirect labour (supervision, inspection, maintenance) is pared to a minimum and specialized job classifications are reduced or eliminated to be replaced by teams of cross-trained, multi-skilled production workers who rotate jobs and take on responsibilities for quality control, repair, housekeeping, and preventive maintenance. This allows lean production to be more efficient since workers can commit themselves to continuously improving productivity and quality. With regard to work organization, the descriptions of lean production are consonant with the various forms of labour flexibility discussed by Atkinson (1985) in the context of his model of the 'flexible firm.' Atkinson's categories are used in this paper to organize our description of lean production at ANC.

As one of the few recent greenfield newsprint mills in Canada,[2] the Alberta Newsprint Company mill represents a new form of restructuring for the industry

1. This assertion has become the focus of much controversy with critics such as Harrison (1994) and Berggren (1992) arguing that lean production is also 'mean production,' resulting in an intensified rhythm of work for workers and loss of jobs. See Babson (1995) for a range of perspectives on this issue.

2. Since 1980, several greenfield pulp mills have been constructed in Alberta, but none except the ANC mill has moved to the production of paper (Pratt and Urquhart 1994).

and one avenue by which the Canadian pulp and paper industry may restructure in response to global trends in markets, technological change, and pressure from environmental concerns. Rather than replacing equipment and altering management and production practices in situ, Alberta Newsprint Company has built a new mill using the latest technology in a town with a forestry complex, but no previous history of newsprint production (Olecko 1976; Pratt and Urquhart 1994; Norcliffe 1994; Holmes and Hayter 1993). Greenfield mills are increasingly attractive to newsprint producers. In many regions, traditional fibre supplies are diminishing partly due to overcutting and partly in response to conservation initiatives. This has heightened interest in the boreal forest of the northern Prairies, one of the last major untapped sources of fibre in North America (Pratt and Urquhart 1994). Regulations requiring increasing proportions of recycled fibre in newsprint are also encouraging greenfield developments close to major urban centres and far from traditional fibre supplies (*Glove and Mail* 1992).

Greenfield locations allow firms to reduce costs by taking advantage of new technology to increase labour productivity and by introducing radically new work practices to reduce unit labour costs.

Greenfield locations allow firms to reduce costs by taking advantage of nearby fibre supplies and new technology to increase labour productivity and by introducing radically new work practices to reduce unit labour costs (Palmer 1994, Storper and Scott 1989, Webber 1986). In a continuous process industry such as newsprint production, firms develop greenfield sites to reduce unit labour costs by increasing labour productivity, not by reducing wage rates (Beaumont and Hunter 1991).

Following the example of European and American newsprint mills, the Alberta Newsprint Company has emphasized functional labour flexibility in its drive to lean production. Previous studies of newsprint production have underscored the importance of such flexibility (Penn and Scattergood 1988; Penn, Lilja, and Scattergood 1992; Beaumont and Hunter 1991). Since the economics of newsprint production make it absolutely crucial to minimize downtime for paper machines, management aims to deploy its workforce as flexibly as possible to keep the paper machine running at full capacity and, thereby, to reduce production costs per tonne of paper (Holmes, 1996; Trudel 1993). Thus, functional labour flexibility which involves training and deploying workers so that they can complete a broader range of tasks is the major goal (Atkinson 1985; European Foundation for the Improvement of Living and Working Conditions 1986; Pollert 1988). Previous research has found little use of numerical labour flexibility in the pulp and paper industry whereby part-timers, short-term contractors and trainees are hired and fired in response to production demands (Penn, Lilja, and Scattergood 1992). Rather, the newsprint industry implements financial flexibility and distancing as complementary strategies that enhance functional labour flexibility.

Financial flexibility, which occurs when pay is tied to performance, productivity and profits (Atkinson 1985; European Foundation for the Improvement of Living and Working Conditions 1986), is used to encourage and reward workers' acceptance of

functional flexibility. Financial flexibility may also allow firms to link labour costs more closely to market prices and production levels, an important consideration in an industry as cyclical as newsprint. Distancing, the replacement of internal employment contracts by external commercial contracts, often through subcontracting (European Foundation for the Improvement of Living and Working Conditions 1986; Harvey 1989), allows the firm to concentrate on its core activities while leaving other firms to achieve cost savings with regard to its more peripheral activities.

To achieve flexible work practices, labour relations in the newsprint industry are being transformed as firms seek to dismantle highly structured internal labour markets that have been the norm in North American pulp and paper mills since the 1940s (Holmes 1996). Traditional mills have complex lines of progression, internal job ladders usually organized by departments within the mill, and seniority rules which often pertain to jobs and lines of progression as well as to mill seniority.[3] There are sharply drawn lines of job demarcation between different production jobs, between the various skilled trades and between production and maintenance jobs, symbolized in many mills by the existence of separate union locals for the two groups. The highly structured internal labour markets have resulted in substantial occupational wage differentials. The top hourly rates are paid to senior production workers on the paper machine—the machine tender and back tender positions—who enjoy a differential of at least $6.00 an hour over skilled maintenance workers. Premiums are also paid for shifts, Sunday working, and for working a statutory holiday. The highly structured internal labour markets also provide the union with a considerable degree of control over the deployment of workers within the mill and present significant barriers to the introduction of flexible work practices and, in particular, the fostering of functional labour flexibility.

No discussion of the role of greenfield sites in Canada is complete without considering examples from resource-based industries.

This study examines the merits of a greenfield restructuring strategy and the attendant changes in work practices designed to improve productivity significantly by increasing functional flexibility within the mill's workforce. The case study complements previous studies of lean production strategies in newsprint mills elsewhere (Penn and Scattergood 1988; Penn, Lilja, and Scattergood 1992; Beaumont and Hunter 1991) by a detailed investigation in the Canadian context. Despite its importance as one of the world's largest producers of newsprint, the Canadian industry has been relatively slow to introduce flexible work practices (Holmes 1996). ANC

3. Traditional mills are defined as those in which workers are represented by the Communications, Energy and Paperworkers (CEP) union (the Canadian Paperworkers Union (CPU) prior to 1993). In the United States, several companies have implemented flexible team-based work systems in nonunion greenfield mills. Many unionized mills in the United States also experienced a significant transformation in production practices as management went on the offensive against restrictive work practices during the 1980s (Eaton and Kriesky 1994; Birecree 1993; Walton 1994). In Quebec mills, at which workers are represented by the Federation des travailleurs du papier et de la forêt union, much more progress was made towards developing functional flexibility during the 1980s than in mills represented by the CPU in either Quebec or the rest of Canada (Bourque and Rioux 1994).

represents a critical test case which may hold important lessons for the successful introduction of labour flexibility in other Canadian mills. The case study will also add to a growing literature about new production methods in greenfield sites (Palmer 1994; Norcliffe and Bartschak 1994; Kenney and Florida 1993; Garrahan and Stewart 1992; Storper and Scott 1989; Webber 1986) that has tended to neglect resource-based industries with their distinctive isolated locations and long distances from industrial complexes. Most attention has been paid to the manufacture of automobiles and their components (Palmer 1994; Kenney and Florida 1993; Garrahan and Stewart 1992); however, as Norcliffe (1994) has pointed out, resource-based industries remain a significant component of the Canadian economy. No discussion of the role of greenfield sites in Canada is complete, therefore, without considering examples from resource-based industries.

This examination of lean production at the ANC mill in Whitecourt, Alberta is organized into four sections. A brief summary of the mill's history provides the context for describing work organization in the ANC mill. Differences in work practices between the ANC mill and traditional mills are highlighted. The implementation of labour flexibility is then discussed in detail. An assessment of these flexible work practices that draws on: semi-structured interviews with management, hourly workers and members of the Whitecourt community; information from questionnaires completed by 96 employees of the mill in July and August of 1993; and published material that includes newspaper, promotional brochures, trade journal articles, and policy statements from the mill follows. The history of a recent wage restructuring at the ANC mill and reactions to it are discussed at some length since they reveal some of the contradictions in the implementation of flexible work practices. The conclusions highlight how geographical isolation and Whitecourt's economic and social history have conditioned the company's success at achieving lean production by increasing functional labour flexibility.

The Alberta Newsprint Company

The Alberta Newsprint Company mill was built after the company was granted the Berland Forest Management Agreement (FMA), the last unallocated forest management agreement in Alberta (*Pulp and Paper Journal* 1988). With the Berland FMA, ANC was assured a secure fibre supply for at least twenty years. During this period, the company is free to manage the forest according to its needs, only subject to provincial statutes that stipulate general principles about the utilization of the forest and the extent, nature and speed with which reforestation must occur (Moen 1990).[4] To obtain the FMA, Alberta Newsprint Company agreed to a negotiated schedule of royalties and committed itself to hiring locally, from an area 75 km in radius around Whitecourt, although no numerical employment targets were set (Pratt and Urquhart 1994).

The provincial government was instrumental in attracting the Alberta Newsprint Company to Whitecourt. Anxious to diversify the Alberta economy, the province

4. There has been public concern that the relevant government statutes provide for the disposition and production of timber without any attention to the forest as an integrated ecological system (Moen 1990; Richardson, Sherman and Gismondi 1993).

provided a $200 million bond guarantee for the company that reduced construction costs and a direct $8.3 million grant for road and rail improvements *(Pulp and Paper Journal* 1988).[5] Whitecourt, located 178km northwest of Edmonton, was chosen as the mill site over a competing location closer to the FMA near Fox Creek. According to Ron Stern, President and CEO of Alberta Newsprint Company, the town offered 'cost-effective access to . . . water, energy and other services, an existing residential community for mill workers, and the availability of power' (Stevenson 1990, 33). Many residents, including the local business community, were enthusiastic about the mill's development which they hoped would reverse economic stagnation that had accompanied a downturn in the oil and gas industry (Zelinski 1993).

Local workers were already familiar with many of the work practices introduced as part of the greenfield strategy.

The local labour market had a pool of workers trained in steam engineering, electrical and instrumentation technologies, and other skilled trades (Olecko 1976). The oil and gas operations that surround Whitecourt were laying off technicians qualified to work in pulp mills and the tradespeople who had serviced rigs and pipelines were already looking for other sources of work. A modern nonunion pulp mill owned by Millar Western, that had opened in 1988 adjacent to a sawmill in the centre of Whitecourt, a second sawmill and a fibreboard plant located in nearby Blue Ridge were potential sources of experienced pulpworkers and tradespeople. In addition to their skills that could be transferred to newsprint production in many cases, local workers were already familiar with many of the work practices introduced as part of the greenfield strategy. With its neoconservative culture, Alberta has a history of antagonism towards unions. This attitude is heightened in the oil and gas servicing industry from which many workers were recruited. Most oil and gas service workers had been self-employed, hired irregularly as jobs were available. While this type of self-employment leads to unpredictable and unstable work hours, it also promotes the autonomy and independent problem-solving essential for flexible work practices.

The ANC newsprint mill was constructed in 1989-90 for an initial capital outlay of $400 million about ten kilometres west of Whitecourt along Highway 43. All under one roof and with an open layout on a single floor, the mill was explicitly designed to facilitate communication among workers from different departments, an essential prerequisite for flexible labour practices and a lean production system. Technologically, the mill was up-to-date, it used highly advanced equipment and paper-making technology to produce world-class newsprint (Alberta Newsprint Company 1992a, 4). The high quality newsprint produced by ANC exhibits excellent brightness, opacity, smoothness and runnability (Jager 1991), the characteristics increasingly demanded for high quality rotogravure and colour printing by tabloid newspapers such as *USA Today*, one of ANC's prime customers.

At the core of the mill there are two linked but distinct sets of production operations: the production of pulp and the transformation of the pulp furnish into high

5. The province had underwritten construction costs for the Millar Western pulp mill in Whitecourt; however, Alberta Newsprint Company was only able to negotiate a loan guarantee (ANC Reel Sheet 1995).

quality newsprint. In the pulp department, the stock is produced by a thermomechanical pulping (TMP) process from wood chips derived from northern whitewoods, such as spruce and lodgepole pines.[6] The wood fibre arrives at the mill-site in the form of woodchips that are processed by three TMP lines that deliver stock to the headbox on the paper machine.[7] A TMP crew consists of three people and a pulp tester who work a rotating schedule of twelve-hour shifts. The shifts run from 7 am until 7 pm and from 7 pm until 7 am, so individuals work two day shifts followed by two night shifts followed by four days off. At ANC, pulping, steam, water treatment and effluent are all combined in one department in contrast to more 'traditional' mills where they are organized into separate departments. As a consequence, ANC employs fewer people in these operations, the operations are highly automated and everyone in the department has to be more qualified; for example, every pulp worker has to have a steam ticket.

The mill has one paper machine, a twin-wire Voith machine built in Brazil and christened 'Wild Rose I' by the workers, which has a trim width of 330" and is designed to operate at 4,600 feet per minute. While rated to produce 625 metric tonnes per day, between 650 and 700 tonnes of newsprint were produced on many days during 1994 and on one day in June 1994 over 798.5 tonnes were produced (*ANC Reel Sheet* 1994c). There are constant efforts to increase output by increasing the speed of the machine while, at the same time, minimizing lost production due to 'breaks' in the paper. To quote from the plant newsletter:

> when 'Rosie' was younger, production records and achievements came pretty fast and furious. ANC had a rather ambitious and challenging start up curve and everyone here met the challenge admirably. As a 'mature' mill the current challenge is to maintain our production and quality standards and 'push the envelope' of paper making. (*ANC Reel Sheet* 1995, 3)

With only one paper machine in the mill, there is tremendous pressure on the operators to keep the paper machine running.[8] If it stops, all production in the mill is brought to a halt. Workers on the paper machine are organized into four crews of six people each with the same shift rotation as in the pulp room. The composition of the crews has remained very fixed with few workers moving between crews. The machine tenders and back tenders who were hired initially all had previous experience in the industry.

6. The mill was designed to use a CTMP pulping process and to add some kraft pulp for strength. However, the high quality of the fibre obtained from the woodchips has meant that the mill uses a straight TMP process with no addition of kraft pulp. In fact, the kraft pulp line has been converted to run a small scale deinking and recycled fibre line which processes recycled newspapers and magazines trucked from Edmonton. The recycled fibre constitutes no more than 10 percent of the pulp supplied to the newsprint machine and increased use of recycled fibre is geographically limited by a lack of an economical source of recycled newspapers. This could become a significant problem for ANC as more and more jurisdictions in the U.S. legislate minimum recycled fibre content for newspapers and magazines.

7. With three TMP lines, maintenance problems in one line can be attended to without affecting production on the paper machine.

8. The mill was designed to allow the addition of a second paper machine at some future point in time. However, market conditions and uncertainties regarding an adequate fibre supply to sustain two machines have so far prevented the building of a second machine.

After the reels of paper come off the machine they are rewound, cut into narrower widths and sent to the finishing department where a fully automated wrap line prepares and labels the rolls of newsprint for shipping. In the finishing department, workers are cross-skilled with each worker trained to operate all the equipment. Workers in the finishing department are also called up to work on the paper machine whenever the paper department is short-staffed.

The three production departments are supported by an array of technical and maintenance staff. Workers are organized into a stores department, a technical department which oversees such activities as testing throughout the mill,[9] a maintenance department, and an electrical and instrumentation group (E&I). There is considerable encouragement of cross-skilling and the elimination of job demarcations among skilled trades workers in the maintenance and E&I departments. However, given the highly automated and integrated process monitoring system used throughout the mill, the E&I are a key group of workers.

Qualifications and competence are the key criteria used to fill vacant positions.

There are a number of significant differences between the organization of work on the paper machine at ANC as compared with the highly structured labour markets in more traditional mills. In the ANC mill, lines of progression are minimized and job titles chosen to be more generic than those used in traditional mills. Only mill seniority would have any relevance in the event of layoff and qualifications and competence are the key criteria used to fill vacant positions.

Staffing throughout the mill is lean. In fact, during interviews several workers commented that the work crews in both the pulp and paper machine departments are so lean that stressful situations arise from time to time. At ANC there is no stock preparation person who is responsible for controlling the flow and mix of pulp entering the paper machine interfacing between the pulp operations and the paper machine. The task is part of the machine tender's job at ANC. Unlike traditional mills, at Whitecourt there is no clothing crew whose responsibility it is to change the felts on the paper machine. At ANC, this task is the responsibility of the machine crews assisted by maintenance staff. Generally the demarcation between production and maintenance jobs is blurred with everyone being expected to pitch in and help when a problem arises. When major problems arise people are simply called in to assist by working overtime. There is no pool of casual or relief workers at ANC.

ANC's prime motivation in developing a greenfield mill was not to seek lower labour costs by paying lower wage rates. In fact, the stated policy of ANC was 'to maintain wage and benefit levels that are competitive with or better than industry standards' (Alberta Newsprint Company n.d., 9). Combined with hourly wage rates higher than union rates in British Columbia mills, the premiums and overtime rates at

9. Both pulp and paper testing are increasingly being automated and testing is being incorporated into operators' jobs. As a result, tasks in the technical department are changing rapidly.

Notwithstanding the high wages, the mill is one of the most cost competitive newsprint mills in all of North America.

ANC, which were also more generous than those paid in unionized mills, result in the highest average hourly wage bill in the Canadian newsprint industry.
ANC management set out to achieve lean production by a set of practices regarding wage structures, work organization, team work, worker recruitment and job training designed to foster functional flexibility and increase labour productivity. From the outset, for example, the ANC mill operated 365 days a year, a practice now common in mills in the United States, but one which has been resolutely resisted in traditional Canadian mills which still observe several common pause-days such as Christmas and Easter. A greenfield site has allowed management to recruit a workforce that is able and willing to adopt flexible work practices that dramatically increase labour productivity. As a result, and notwithstanding the high wages, the ANC mill is one of the most cost competitive newsprint mills in all of North America.

Recruiting a Flexible Workforce

Alberta Newsprint Company's competitive lean production strategy has focused on developing a well-paid, well-trained and committed core workforce within the mill which allows high levels of operating flexibility, maximum capacity utilization and very high labour productivity. To this end, recruiting occurred in stages. A core group of employees was recruited by one of the principal investors, President and CEO, Mr. Ron Stern, and the plant manager, Mr. Fred Row. Experienced pulp and paper workers were recruited through personal contacts of the core group who also visited mills to publicize job opportunities. Once jobs were advertised in the local area, more than 2,200 applications were received (Stevenson 1990, 35). Although the majority of employees were interviewed by coworkers and representatives of management, only about half (53.8 percent) were tested formally. These were mainly local applicants from the Millar Western pulp mill, the oil and gas industry, nearby sawmills, and the skilled trades. Few experienced papermakers or pulp workers completed any formal tests.

The current workforce consists of three groups: experienced papermakers and some pulp workers recruited from mills across Canada; skilled local workers whose training, qualifications and previous experience were immediately applicable to jobs with ANC, for example, electrical and instrumentation technicians from the Alberta oil and gas industry, pulp room operators from the local pulp mill and millwrights and pipefitters from nearby sawmills; and finally, local residents who had unrelated experience in other industries. There are important demographic differences among the three groups that coincide to some extent with departmental divisions within the mill (Table 1). The experienced pulp workers and papermakers recruited from elsewhere tend to be older and hold more senior positions than their local counterparts. Among skilled workers hired locally, there are older maintenance workers and fairly young pulp workers. In contrast, local residents working in the finishing department are among the youngest workers in the mill. Approximately 90 percent

of the sample was working at the time they accepted a position in Whitecourt. The average age of the ANC workforce is less than in more longstanding newsprint mills such as those at Corner Brook, Gatineau and Powell River. In the latter, seniority-based layoffs and limited recruitment have removed many younger workers and left large concentrations of workers in their forties and fifties. The younger age profile of the workforce at the Whitecourt mill is financially advantageous to ANC, reducing the payroll costs of benefits such as workers' compensation, long-term disability, and life-insurance premiums.[10]

Many people bring to their jobs with ANC attitudes and experiences gained in other industries. Again, because of recruiting practices, industrial backgrounds vary substantially among departments. Most of the papermakers and senior pulp workers have first-hand experience of unionized newsprint mills with traditional work practices (Table 1). Among workers recruited from other industries, there is a variety of backgrounds. Many maintenance workers recruited from sawmill and mining backgrounds have experience of unionized workplaces unlike those who worked previously in the oil and gas industry. The recruiting process resulted in those with industry experience being hired first. As a group, the papermakers especially have

Table 1
Alberta Newsprint Company Workers by Department

	Paper	Pulp	Finishing	Maintenance	Other*
Year of Hire					
1989	15.8	20.0	0.0	3.8	26.7
1990	68.4	26.7	46.2	69.2	53.3
1991	10.5	0.0	23.1	15.4	6.7
1992	5.3	33.3	7.7	3.8	13.3
1993	0.0	20.0	23.1	7.7	0.0
Previous Industry					
Paper	52.6	40.0	0.0	38.5	26.7
Other private	42.1	53.3	69.2	50.0	66.7
Government and self-employed	5.3	6.7	30.8	11.5	6.7
Year of birth					
before 1950	10.5	6.7	0.0	11.5	13.3
1950-59	42.1	33.3	46.2	73.1	60.0
1960-69	42.1	46.7	30.8	15.4	20.0
since 1969	5.3	13.3	23.1	0.0	6.7

Source: Calculations by authors.
*Other includes electrical and instrumentation, stores,technical, and administration departments.

10. This is an important feature of greenfield plants in mature cost-competitive manufacturing industries (Howes 1991).

influenced hiring and training practices, the initial wage structure, and the implementation of management practices such as the team concept because they were the initial group hired.

Self-reliance, being a team player and motiviation were the characteristics mentioned often as the most important.

Regardless of their backgrounds, current employees largely share management's views about the desired attributes of workers. Management sought to 'recruit people with old-fashioned common sense and values; people with the desire to excel at whatever they do' (Alberta Newsprint Company 1992a, 12). The personal qualities sought were 'honesty, reliability, a good work ethic, trustworthiness, and self reliance' (Stevenson 1990, 35). When asked to choose from a list of nine alternatives, the characteristics that had helped him or her get a job at ANC, workers were most likely to select work ethic, being a good team player, self-reliance, problem-solving skills, and expertise.[11] Open-ended questions that asked workers to list the criteria for getting a job at Alberta Newsprint Company and to indicate the most important of these criteria elicited similar responses. Self-reliance, being a team player and motivation were the characteristics mentioned often as the most important.

The lack of importance given to experience in the industry and seniority is startling. It confirms that pulp and paper experience per se was not perceived as an important attribute to qualify for a job by either the workers or management. Even those with industry experience considered it less important than the ability to be a team player, a crucial attribute if the mill was to achieve functional labour flexibility.

Flexible Work Practices

Functional flexibility, which is at the core of management's efforts to achieve lean production at Alberta Newsprint Company, is promoted by multi-skilling and cross-skilling, teamwork, and extensive use of overtime. Multi-skilling and cross-skilling take various forms among mill departments. In general, production workers are encouraged to undertake and assist with maintenance tasks. During shutdowns for maintenance, production workers do much of the work that has been planned and scheduled by the maintenance department, rather than being laid off temporarily (Hallewell 1993). Production workers also do ongoing maintenance as minor problems arise. Trades and production workers collaborate whenever the paper machine breaks down, with both groups of workers staying after scheduled shift changes to complete repairs.

Cross-skilling is encouraged through teamwork. Senior employees are designated as trainers whose job responsibilities include training their teammates on the job. The most advanced forms of cross-skilling are in the warehouse and technical departments where workers are trained on every piece of equipment to do every task (Steinback 1993). Functional flexibility is enhanced greatly by cross-skilling, but it also has the effect of reducing the numbers and levels of supervisors.

11. Work ethic, being a team player, and self reliance were identified as criteria for getting a job by 93.2 percent, 92.0 percent, and 87.5 percent, respectively, of the sample.

Maintenance workers have also been encouraged to acquire numerous skills both formally, through policies that reimburse educational expenses and increase the wages of workers with multiple trades, and informally, through the implementation of teams. The company reimburses relevant educational expenses and it is committed to establishing an apprenticeship training program (Alberta Newsprint Company n.d.). Both policies encourage multi-skilling, particularly among maintenance workers who cannot qualify for trades certificates without formal training off the job.

Three types of teams have been introduced to foster cross-skilling, multi-skilling, trouble-shooting and autonomy.

Management also made work assignments and designed work teams that would encourage workers to cooperate with each other and with management to search continuously for better and more efficient ways of doing things. Three types of teams have been introduced to foster cross-skilling, multi-skilling, trouble-shooting and autonomy, all key elements of functional labour flexibility (Alberta Newsprint Company 1992a, 12). Within each crew and in each department, teamwork is encouraged by senior employees trained as team leaders and regular department and crew meetings at which collective problem-solving and cooperation are emphasized. Continuous quality improvement (CQI) teams are formed to address specific production and policy problems (*ANC Reel Sheet* 1995). Staff from different shifts and departments who are affected by the particular problem serve on the team until a recommendation is implemented that redresses the problem. On each CQI team, a trained facilitator ensures that meetings are scheduled, minutes are recorded, and the team operates effectively. The last type of team operates at the mill level. The cross-organizational mill committee is a standing committee that includes representatives from each department and senior management who meet monthly to discuss general policy issues raised by management and workers. Two standing committees that include representatives of workers and management are responsible for safety and pensions and benefits issues. Management attempts to include workers' families as part of the team by holding quarterly general meetings where the mill's financial results and other mill issues are discussed. During construction, management used the general meetings to inform workers' families about overtime and work schedules planned during start-up in an effort to create a cohesive corporate culture.

The composition of the various types of teams that include personnel from various shifts, seniority levels and departments promotes communication and cooperation within the mill. With the implementation of CQI teams, management is clearly trying to promote independent problem-solving. In recent interviews, many employees and management expressed satisfaction with the CQI teams because of their limited mandate, finite existence and representation from all relevant departments and shifts. Hourly paid workers' reactions to the cross-organizational mill committee and special policy committees such as the recent wage restructuring committee were mixed. Some felt that when it comes to key policy issues, management's objectives are asserted.

Overtime is an important means of achieving lean production at ANC. The existence of a high degree of cross-skilling and flexibility in assigning workers to jobs through the use of the team concept and the absence of a union collective agreement con-

Overtime is an important means of achieving lean production at ANC.

taining restrictive work practices permit management to use its skilled and experienced core workforce to work extensive overtime. Thus, overtime is used at ANC to maintain continuous production and overcome problems created by absenteeism, sick-leave, and machine breakdowns without having to resort to 'casual' or 'spare' workers found in most traditional mills. But, in turn, by eliminating the need to hire temporary or casual workers, overtime encourages joint problem-solving by maintenance and production workers, promotes multi-skilling, and allows workers who are accustomed to extra wages from overtime to maintain their incomes (Trudel 1993). Overtime is particularly lucrative at ANC where it is paid at double time as compared with time-and-a-half in traditional mills. More than 20 percent of the sample reported more than 200 hours of overtime in the past year (Table 2). At the other end of the spectrum, only 15 percent had worked less than 40 hours of overtime. These reports are subject to error, but they indicate that on average, hourly employees at ANC work more than three tours of overtime annually, well above the national average for manufacturing (Morissette and Sunter 1994). In light of the many hours of overtime, it is not surprising that more than 47 percent of workers in our sample reported that they were called in for extra work at least once a month during the past twelve months.

Table 2
Annual Frequency of Overtime and Call-In

	Relative Frequency (%)
Overtime hours:	
less than 40	14.8
41 - 80	13.6
81 - 120	20.5
121 - 160	15.9
161 - 200	14.8
more than 200 hours	20.5
Number of times called in:	
0	4.5
1 - 5	26.1
6 - 10	21.6
11 - 15	21.6
16 - 20	6.8
More than 20	19.3
N	88

Source: Calculations by authors.

Financial Flexibility

The wage structure at the ANC mill when it opened in 1989 represented both significant continuities and breaks from wage structures in traditional mills. The continuity was expressed in the replication of traditional occupational wage differentials between papermakers and other mill workers. The most striking breaks from past wage setting practices in the industry were the introduction of a pay-for-knowledge scheme and a bonus system applied to all mill employees. Both of these were designed to encourage and reward functional labour flexibility. The former provided an incentive for workers to become multi-skilled and the latter to some degree tied pay to performance.

For the mill start-up it was thought essential to hire experienced papermakers from existing mills to form the nuclei of the machine crews. To attract these experienced workers prevailing competitive hourly rates and shift and overtime premiums had to be paid, and traditional occupational wage differentials were reproduced (Table 3). Thus, the machine tenders with a rate of $27.71 an hour enjoyed a $3.21 an hour differential over the TMP Shift Engineer (a position which required professional standing as an engineer) and a $6.11 per hour differential over the skilled tradespeople. Wage rates for each position were among the best in the industry.

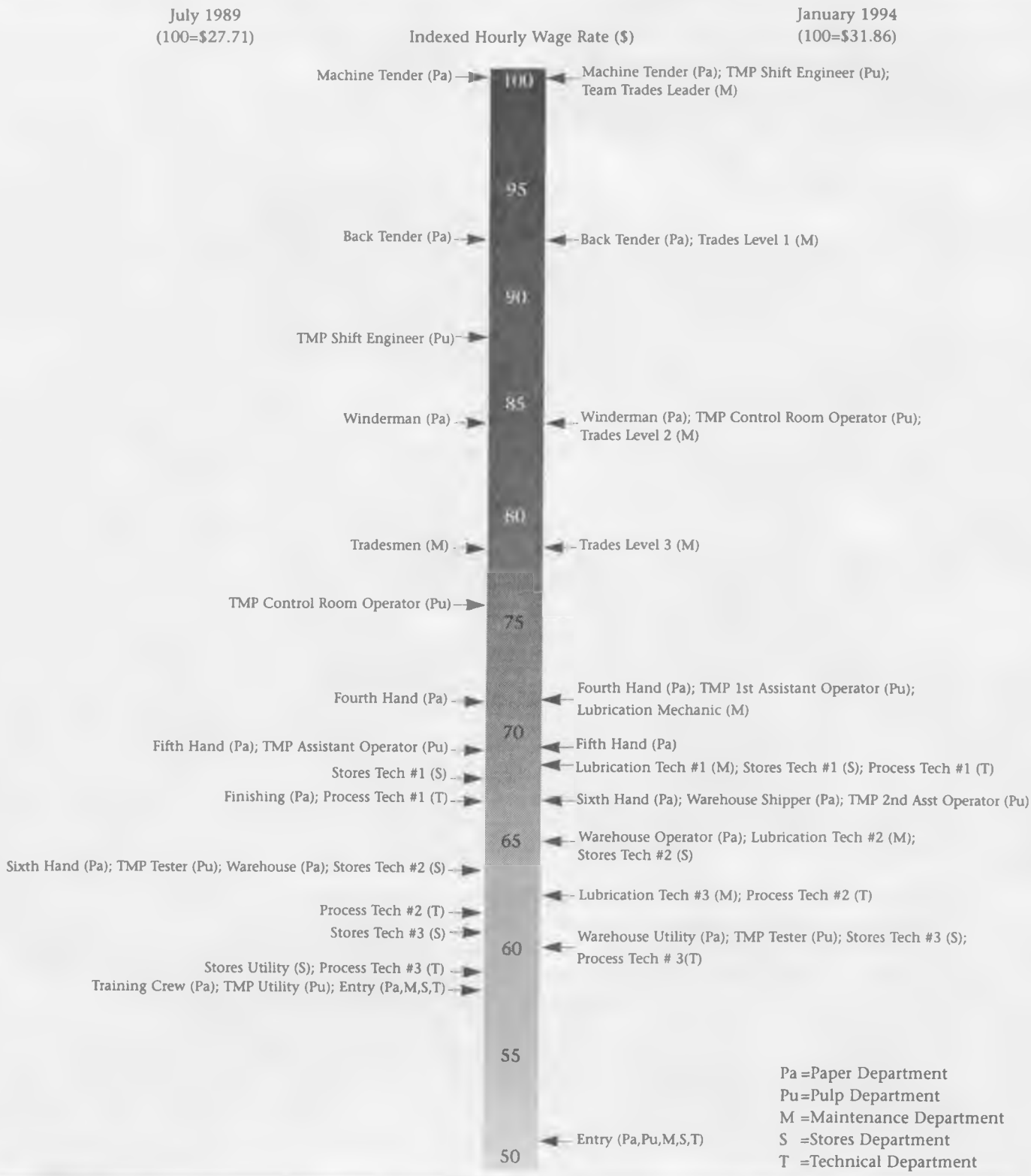
From the outset, in order to foster multi-skilling and functional labour flexibility, ANC introduced a pay-for-knowledge system.

From the outset, however, and in order to foster multi-skilling and functional labour flexibility, ANC introduced a pay-for-knowledge system. The company stated that it would 'make every effort to train employees upwards. Similarly, every employee has the duty to train towards the top position' and that 'employee pay rate will correspond to the level of knowledge and the ability to perform in various capacities' (Alberta Newsprint Company n.d., 24). Thus, from the beginning hourly rated workers were paid according to the level to which they had trained rather than according to the rate attached to the job they were performing at any given point in time. The pay-for-knowledge scheme encouraged and rewarded the acquisition of multiple skills and greatly facilitated the flexible assignment of workers to tasks. It also enabled the use of 'leaner' work crews and of call-in and overtime, rather than casual workers, to deal with unexpected production problems and scheduled maintenance.

The extent of pay-for-knowledge varies among departments. It is more common in the papermaking and pulp departments than among the trades in the maintenance department (Table 4). Two factors contribute to departmental variations. First, the geographical isolation of Whitecourt combined with its previous reliance on the oil and gas industry have placed skilled trades workers at a disadvantage relative to production workers in their efforts to qualify for pay-for-knowledge. In the maintenance department, workers must complete apprenticeships that require offsite training for several periods of three months. The closest location for such training is Edmonton. The Pembina Educational Consortium in Whitecourt provides distance education on a part-time basis, but it does not offer the required courses for most

Table 3

Alberta Newsprint Company Mill, Whitecourt, Alberta, Occupational Wage Differentials at Start-Up (July 1989) and Following Wage-Restructuring (January 1994)



Sources: Alberta Newsprint Company (1989, 1993).

apprenticeships. Workers may take a three month paid leave for apprenticeship courses only once every two years. As a result, an apprenticeship is rarely finished in less than 8 years. Wage premiums related to pay-for-knowledge are paid only upon completion of an apprenticeship. Maintenance workers receive no wage increases as they complete each stage of the apprenticeship training.

Table 4
Pay-for-Knowledge by Department

Department	N	Relative Frequency Yes	No	Other
Paper	19	63.2	26.3	10.6
Pulp	15	53.3	46.7	0.0
Finishing	13	46.2	53.8	0.0
Maintenance	26	30.8	65.4	3.8
Other	15	20.0	80.0	13.4
Total	88	39.8	54.5	5.7

Source: Calculation by authors.

In other departments, most training occurs on the job. Papermakers have to do on-the-job training and pass tests to qualify for more senior positions. Normally, they can fit training into their regular jobs so papermakers can train fairly quickly and efficiently. In the pulp room, steam engineering tickets are required to qualify for more senior positions. The steam engineering courses are offered locally through the Pembina Educational Consortium where they were instituted to train local residents for the oil and gas industry. ANC also set up a computer link that allows workers to complete coursework from the mill. One of the senior employees in the pulp room was designated as the on-site resource person to assist people trying to pass the steam engineering courses. Students are also allowed to operate required equipment on the job so they accumulate the hours of experience required for each ticket.

Also, there are a greater number of positions for which production workers can train than there are for the trades. For example, there are six positions for papermakers and another four positions in the warehouse included in the paper department. In contrast, there are four levels for trades workers (Alberta Newsprint Company 1993).

An annual bonus paid to all employees for profitable, high quality, and safe production constitutes the second break from traditional wage setting practices.

An annual bonus paid to all ANC employees for profitable, high quality, and safe production constitutes the second break from traditional wage setting practices in the industry and, by tying a part of compensation to productivity and performance, represents an element of what Atkinson (1985) has termed financial flexibility. The bonus is calculated on the basis of a complicated formula that reflects the quality of

the paper, environmental performance of the mill, production levels, safety record, and production costs.[12] Bonuses are paid only if the mill increases productivity while maintaining or improving the quality of the paper and environmental and occupational safety and achieving cost savings.

In summary, the mill's initial wage structure was similar to that of the industry as a whole despite the introduction of pay-for-knowledge and some move towards financial flexibility represented by the productivity-linked bonus scheme. In particular, the wage structure at ANC mirrored that in traditional mills in that there was a similar pattern of wage rate differentials between the various occupations (Table 3). Production workers in the paper department earned higher wages than skilled trades workers. However, and as discussed in more detail below, this aspect of wage setting was radically restructured in 1994, four and a half years after start-up.

Distancing

ANC has pursued a number of distancing strategies. Of these, the most important concerns the fibre supply. ANC has subcontracted most fibre harvesting including the majority of felling, loading, and chipping activities. Operating with a just-in-time inventory system, the mill tries to maintain a very low inventory of chips on site.[13] To this end, most fibre harvesting is subcontracted to nonunionized independent operators based in Fox Creek. Some operators work exclusively for the Alberta Newsprint Company, for example, Cho Yen Trucking, which operates log trucks, loads logs, constructs, grades and maintains logging roads, and hauls chips (*ANC Reel Sheet* 1994a, 1994b). Most chips from the FMA are produced by independent operators, although Alberta Newsprint Company does operate its own chipper. Chips from the FMA are supplemented by chips obtained both from a sawlog exchange with Millar Western, which operates a saw mill and pulp mill in Whitecourt, and from the market. Alberta Newsprint Company initiated the system of fibre exchanges in Alberta that is now an integral part of pulp and paper production in the province (Pratt and Urquhart 1994). For each tree delivered to the Millar Western sawmill to be sawn into higher value lumber, ANC receives the equivalent of one and one half trees in chips produced from sawmill waste or inferior quality trees suitable only for pulpwood. At any time, the mix of chip sources depends upon market prices. In December 1993, more than half of all chips were bought on the market (McCammon 1993). Independent contractors also remove sludge from the ponds where mill effluent is treated. Although these contractors work only for ANC, like the log and chip hauliers they are not part of the mill's permanent workforce.

ANC also has had an unusual marketing arrangement whereby MacMillan Bloedel Ltd acts as the marketing agent for ANC newsprint (*Pulp and Paper Canada* 1988).

12. The many parameters considered in calculating the production bonus include customer's quality claims and quality rankings, license violations of environmental regulations, world ranking in productivity for comparable newsprint machines, the mill's health and safety record compared against B.C. mills, and cost savings. While each of the quality, environmental, safety and production criteria have a maximum value of 1.25 percent of the basic straight time wages, there is no maximum cap placed on that part of the bonus generated by cost savings (Alberta Newsprint Company 1992b). Unlike traditional mills where a productivity bonus is paid only to paper makers (Holmes, 1996), at ANC the bonus is paid to all workers in the mill including administrative staff.

13. Fresh chips produce whiter paper without having to resort to more chemicals.

This is the first time MacMillan Bloedel has marketed paper for another producer. As part of the initial marketing arrangement, it was agreed that ANC would shut down whenever MacMillan Bloedel had to shut down its own mills in response to excess paper supply.[14] However, as a result of growing customer demand for the high quality specialty newsprint produced in Whitecourt, this clause has never been invoked even though MacMillan Bloedel has been forced to close some mills for market-related inventory adjustments on a number of occasions.

Finally, and as is common throughout the industry, the ANC mill subcontracts maintenance work during scheduled shutdowns. The number of maintenance workers doubles as skilled tradespeople are hired temporarily to work with the permanent staff completing planned maintenance projects (Hallewell 1993).

Distancing strategies take advantage of conditions in the local labour market.

All of these distancing strategies take advantage of conditions in the local labour market. As an oil and gas centre, Whitecourt had a large transportation sector with many independent hauliers who had worked servicing the oil and gas fields. In addition, there was a pool of skilled trades workers who had been full-time employees of oil and gas firms and their subcontractors. ANC was able to draw upon this skilled labour force to subcontract peripheral activities.

Subcontracting has reduced the size of the workforce directly employed by ANC. When first announced, the mill was expected to employ about 185 people in Whitecourt, another 180 in a woodlands operation in Fox Creek, and approximately 10 people in an Edmonton head office. When the mill began production in August 1990, permanent employees included approximately 200 people in Whitecourt and Fox Creek combined and between 8 and 10 in a head office in Vancouver. ANC's woodlands operation employs less than a dozen people but these numbers do not include people working for various independent subcontractors whose jobs depend upon the mill's continued operation. The marketing staff is also smaller than expected.

Reactions to Lean Production at ANC

Lean production at the ANC mill is similar to that reported elsewhere for the paper industry (Penn, Lilja and Scattergood 1992). Needing a skilled workforce, ANC relies on functional labour flexibility to increase labour productivity and thereby, reduce unit labour costs. Initially, pay structures in the mill were intended to encourage the training and commitment to improvements in production essential for functional flexibility, while maintaining the traditional wage hierarchy of production and trades workers. Subcontracting does not occur with production itself. Rather ancil-

14. This clause was probably included to head off opposition from the Paperworkers Union since all MacMillan Bloedel's mills are unionized. If ANC continued to operate during downtime at MacMillan Bloedel mills it could be construed as switching production out of the bargaining unit to a nonunion production site.

lary functions; logging, chipping, transportation, marketing, and irregular but planned major maintenance projects, are subcontracted.

Most workers are very satisfied with jobs they see as offering career advancement, autonomy, and a safe working environment.

Hourly workers are extremely satisfied with lean production at ANC. More than 90 percent of the workers in our sample reported that overall they were extremely or quite satisfied with jobs at ANC. Only 7.7 percent reported dissatisfaction. As reported elsewhere by both proponents (Kenney and Florida 1993) and critics (Berggren 1992), job satisfaction arises from many of the work practices that are considered part of lean production. The emphasis on pay-for-knowledge, training, and teamwork with few supervisors is attractive to most hourly workers. Responses to a series of Likert scales revealed that workers at ANC find their jobs challenging and safe. More than 84 percent agreed that working at ANC was always challenging even though many found their jobs repetitive (Table 5). A slightly lower, but still substantial, 70.4 percent reported that ANC offered opportunities for career advancement. Workers have mixed views of their autonomy and authority on the job. While a high proportion, 85.4 percent, disagreed that they had little control over their work, only 68.2 percent agreed that they had a say in decisions. Finally, ANC is considered a safe place to work by more than 97 percent of our sample. The consensus among workers about the mill's safety contrasts both with management concerns that have culminated in the creation of a new safety committee and with the accident rate at the ANC mill as compared with mills in British Columbia, the comparison upon which part of the pay bonus is based. Despite the differences between workers' and management's views of safety, levels of job satisfaction are high. They indicate that recruiting was successful. Most workers are very satisfied with jobs that they see as offering career advancement, autonomy, and a safe working environment.

Table 5
Opinions Regarding Work at the Alberta Newsprint Company

Working Conditions	Agree Strongly	Agree Somewhat	Disagree Somewhat	Disagree Strongly
Repetitious	8.0	50.0	23.9	18.2
Provides career advancement	29.5	40.9	22.7	6.8
Safe working environment	56.8	40.9	2.3	0
Have little control	0	4.5	28.4	67.0
Always challenging	40.9	43.2	11.4	4.5
Have a say in decisions	23.9	44.3	22.7	9.1
N	88			

Source: Calculation by authors.

Although the extent of the conflict should not be exaggerated, the implementation of lean production has led to unexpected conflicts and contradictions within the mill. Despite the overall satisfaction with jobs and working conditions, there is tension among departments within the mill, particularly with regard to the wage structure and pay-for-knowledge system. At the time of our interviews in Whitecourt, a special cross-mill committee of hourly workers and management was in the process of developing new wage structures for mill personnel. The committee was struck after hourly workers raised concerns about the wage structure at a quarterly general meeting. Implementation of their final proposal began in August 1993.

The ways that wages were restructured illustrate some of the contradictions inherent in the efforts to create a new workplace culture centred around lean production practices at ANC. The first issue involved occupational pay differentials within the mill. While the initial wage differentials mirroring those in traditional mills were taken for granted by the senior paper machine and pulp workers who had been recruited from within the industry, they were increasingly challenged by the skilled trades workers. The latter thought that they deserved to be paid top rates since their skills were necessary for keeping the sophisticated state-of-the-art machinery running. Thus, the wage restructuring committee's first task was to propose a plan for equalizing the top wage rates among departments.

The second and related major issue addressed by the committee concerned pay-for-knowledge and, in particular, the considerable differences that existed between departments with regard to the ease with which workers could 'train-up.' The committee was asked to address the inequities in opportunities for pay-for-knowledge among the maintenance, pulp, and paper departments.

Any restructuring of wage levels in the mill must be revenue neutral.

In arriving at its recommendations the wage restructuring committee had to strike a balance among a number of competing objectives. First, the company had established a strong commitment to promoting maximum training through its unrestricted pay-for-knowledge policy. Second was the conflict between the experienced papermakers, who took 'as natural' the traditional occupational differentials in the industry which accorded them the highest wages and prestige, and the locally hired tradespeople who saw themselves as belonging at the top of the hierarchy given the 'normal superiority' of skilled trades over production workers in many other industries. Third, the committee was to ensure no loss of pay for overtime. Fourth, management was concerned that any restructuring of wage levels in the mill must be revenue neutral in order to contain overall labour costs.

The major recommendations were developed after the committee visited newsprint mills in the United States that are viewed as Alberta Newsprint Company's chief competitors. The visits appear to have influenced the committee which recommended the creation of three senior positions in maintenance to be paid at rates equivalent to those of the three top positions in the paper department (Table 3). The wage rate for the shift engineer in the pulp room was also to be raised equal to that of the highest paid papermaker. Creation of senior positions for tradesworkers (team trades

leader, trades level 1, and trades level 2) fits the company's lean production policies by encouraging multi-skilling. The policy corresponds with current practices in American mills that offer high rates for senior maintenance positions.

To finance the new wage rates, savings in wage costs had to be found elsewhere. In the American mills, low base rates for maintenance workers provide the cost savings, but this strategy was not pursued at ANC because of the commitment to paying wage rates which are competitive within the Canadian pulp and paper industry. Instead, some premiums were eliminated although overtime is still to be paid at double rates. Indeed, when everyone in the mill was moved to a salary in January 1994, formerly hourly paid workers were still to be paid additional monies for overtime. Pay-for-knowledge is to be limited. In each department, the number of workers who may receive higher wages after training is now capped for each position. To soften the impact of these caps, junior positions in the finishing, technical, and stores departments are not subject to any limits on the numbers of workers who may obtain pay-for-knowledge.

In attempting to reconcile competing goals, the wage restructuring proposals have not resolved the contradictions inherent in the way that lean production practices were introduced at ANC. Nor can they be expected to. To encourage training, a prerequisite for multi-skilling, ANC's policies have inadvertently favoured some workers over others. Differences in the concrete nature of the work in different departments and the geographical isolation of Whitecourt have exacerbated differences in the treatment of various workers. Limited opportunities for training in the local area limit the ease with which various workers may achieve pay-for-knowledge. To implement teamwork in which workers act as trainers for their colleagues, the company hired experienced papermakers and pulp workers from elsewhere. These workers expected and received the wage premiums that they had enjoyed in traditional mills. Employees hired locally who are amenable to the multi-skilling and cross-skilling that the company wished to implement tend to be in maintenance, finishing, and technical departments where wages have been lower and often offered fewer opportunities for advancement.

Conclusions

The description of lean production at the Alberta Newsprint Company in Whitecourt, Alberta provides some insight into the nature and impact of flexible work practices in the Canadian newsprint industry. Typical of the most advanced mills elsewhere, Alberta Newsprint Company emphasizes functional labour flexibility in its drive for lean production. The demands of the continuous production process mean that there is only one workforce, the core workforce, that can be deployed flexibly. Numerical labour flexibility as discussed by Atkinson (1985) is simply not a viable option for lowering labour costs in the paper industry. This case study of a competitive Canadian mill suggests that functional labour flexibility can be employed as effectively in Canadian mills, as in European and American mills.

What does the success of the ANC mill signify for the future of the newsprint industry in Canada? First, it has demonstrated that it is possible for a Canadian mill to achieve levels of world competitive efficiency. The apparent ease and success with which lean production methods were implemented at ANC, however, might not be

so easy to achieve across the industry. It must be remembered that the ANC mill was a greenfield mill and, due to recruitment strategies and their previous work cultures, many of the workers hired were willing to buy-in to lean production methods. As White (1994, 54) stresses, the context in most established Canadian newsprint mills is very different and 'it seems unlikely that management will make much headway with notions of trust and cooperation in a situation of continued cutbacks and insecurity.' Second, if more and more mills do follow ANC's lean staffing strategy, it suggests that there will be far fewer workers in the industry as a whole and that individual mills will have much less impact on the economies and cultures of the communities in which they are located than was traditionally the case. The ANC mill, with only 200 directly employed workers, is far less significant to life in Whitecourt than was the case with mills in quintessential milltowns such as Powell River in British Columbia. In the latter, the mill and its associated institutions, such as the union, shaped and dominated virtually all aspects of everyday life.

Even in a greenfield setting the introduction of lean production strategies can be complicated.

The findings also suggest that even in a greenfield setting the introduction of lean production strategies can be complicated and result in unexpected effects within and outside the workplace (Harrison 1994).

Functional labour flexibility increases the interdependencies among management decisions regarding other elements of a lean production strategy. As the case study shows, changes in wages and wage structures have immediate implications for efforts to achieve a multi-skilled, cross-trained workforce. The same is also true of distancing strategies, although we have not emphasized them here. Management has concentrated on a core workforce within the mill, subcontracting all ancillary functions. While this decision, by reducing the variety of positions, departments, and types of workers, has simplified efforts to introduce functional labour flexibility within the mill, trades workers have expressed concern about the potential adverse consequences of the contracting-out strategy for their jobs. The complex interplay among strategies for achieving flexibility means that the traditional wage and status hierarchy among papermakers, trades workers and other production workers initially prevailed at ANC. Recent revisions of wage rates may accelerate the difficult process of dismantling these hierarchical relations.

Finally, the case study illustrates how geography plays an important role in any greenfield strategy. For resource-based industries, location is a crucial element, mediating the effects of restructuring (Norcliffe 1994). Whitecourt's social history has added to the challenges faced in the introduction of flexible labour practices at ANC. There is a strong entrepreneurial culture of independent contracting and working with minimum levels of supervision in the Alberta oil and gas servicing industry, the industry in which many ANC workers had previously worked. This, coupled with the neoconservative political climate in Alberta, facilitated the building of a nonunion mill and the introduction of new work practices. Workers recruited from the local oil patch have little tolerance for the highly structured internal labour markets that characterize traditional Canadian paper mills. Their impatience is most obvious in

continued dissatisfaction with a wage and status hierarchy that favours papermakers. Whitecourt's location has also impeded the successful introduction of flexible work practices. Skilled trades workers, many of whom were hired locally, find that their efforts to train up are adversely affected by Whitecourt's isolation. Too far from Edmonton to commute daily for specialized technical education, trades workers are less able to take advantage of pay-for-knowledge than other workers. As a result, the skilled trades feel frustrated in their efforts to benefit from the company's commitment to training and continuous education.

Ironically, while too far to facilitate training, the relative proximity of Edmonton, combined with the decision to minimize the size of the core workforce, has reduced the local economic benefits generated by the mill. The local business community enthusiastically embraced ANC's plans to locate just outside Whitecourt (Zelinski 1993); however, the local economic impact of the mill has been less than expected (Walker 1993). The mill tries to use local suppliers; however, its specialized needs can be met only by firms in large urban areas, such as Edmonton. Millworkers take advantage of 4-day rest periods between tours of duty to travel to Edmonton for shopping and recreation. The Whitecourt business community is now reassessing its development plans in light of the limited economic stimulus from the ANC mill.

In its efforts to achieve lean production by instituting flexible work practices at a greenfield site, ANC has succeeded in achieving high rates of labour productivity. Its success parallels that of greenfield strategies in other industries (Kenney and Florida 1993; Palmer 1994), where new workforces have adopted flexible work practices with enthusiasm. However, ANC also shares some of the problems encountered at other greenfield sites where traditional and novel practices have clashed. The geographical isolation of the ANC mill that is typical of resource-based industries has exacerbated these contradictions. Further research is needed to document the continued evolution of labour flexibility at ANC and to compare the experiences of management and workers at the Alberta Newsprint Company mill with those of other mills attempting to institute flexible work practices both in other greenfield locations and through in situ work reorganization in longstanding mills. Only comparative research can reveal the particular characteristics of places that will affect firms' efforts to achieve lean production in the newsprint industry and the ways that local labour markets and communities shape lean production strategies.

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