Survey of Diffusion of Technology in the Mining Industry

Industry, Science and Technology Canada,
Information Technologies Industry Branch

CANMET,
Energy, Mines and Resources Canada

Communications Canada

Statistics Canada,
Small Business and Special Surveys Division

Mining. Research development. computers. Automation.

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Canada

56 **Survey of Diffusion of Technology in the mining industry/** F. Bolduc, M. Clapham, D. Doyle, M. Issa, B. Mahony and J. Pathak. -- (Statistics Canada, 1990), 87 pages.

This survey provides up-to-date information on the current and planned use of computer-based technologies and applications within Canada's mining sector. The results show that 235 Canadian mines are riding the "wave of technological change", of which two-thirds have seen positive improvements in productivity, more than half have realized improved product quality; and two-thirds have experienced a reduction in operating costs. The fact that more than three quarters of the mines surveyed use one or more of the 28 specified advanced technologies indicates the extent to which the traditionally conservative mining industry has so far, perceived and sounded these technologies. The industry is aware that technology transfer is the key to unlocking the enormous potential of these technologies and that the wholesale adoption of computerized information and technical control systems is accelerating rapidly.

Cette enquête propose de l'information nouvelle sur l'utilisation actuelle et prévue des technologies informatiques et de leurs applications dans l'industrie minière. Les résultats de cette enquête que 235 mines canadiennes se joignent à ce courant de changement technologique, duquel deux-tiers ont perçu une amélioration de la productivité, plus de la moitié ont réalisé une amélioration de la qualité du produit et les deux-tiers ont connu une réduction de leurs coûts d'opération. Le fait que plus du trois-quart des mines recensées utilisent une technologie ou plus parmi les 28 technologies proposées, indique le degré de sensibilisation atteint par l'industrie minière même si elle est généralement considérée comme traditionnelle. Beaucoup de signes indiquent que l'industrie est fortement sensibilisée au fait que le transfert technologique est la clé pour accéder au potentiel énorme de ces technolgies et que l'adoption généralisée de l'informatique et des systèmes de commande accélère.

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Industry, Science and Technology Canada

Canada Centre for Mineral and Energy Technology (CANMET)

Communications Canada

Statistics Canada

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FOREWORD

The capacity of Canadian firms to adopt and diffuse technology has a considerable impact on their ability to remain competitive. To quote from a landmark study "companies that refuse advanced information technologies will find themselves left behind by their competitors. Introducing new information technologies will be a competitive necessity in the 1990's." Technological change is a crucial means to economic advancement. It is the key to improvements in productivity, global competitiveness, and ultimately, employment. Rapid adoption of new technologies is vitally important to future prosperity.

This survey provides up-to-date information on the current and planned use of computer-based technologies and applications within Canada's mining sector. It is intended to help industry appraise its current and projected use of selected technologies. It provides the mining industry, as well as technology developers, with useful information on the future implementation of widely used and emerging technology applications.

It was evident from the survey results that 235 Canadian mines are riding the "wave of technological change", of which two-thirds have seen positive improvements in productivity, more than half have realized improved product quality; and two-thirds have experienced a reduction in operating costs.

The fact that more than three quarters of the mines surveyed use one or more of the 28 specified advanced technologies indicates the extent to which the traditionally conservative mining industry has so far, perceived and sounded these technologies. There is ample evidence to show that the industry is very aware that technology transfer is the key to unlocking the enormous potential of these technologies and that the wholesale adoption of computerized information and technical control systems is accelerating very quickly.

This report highlights the major findings of the survey of Diffusion of Technology in the Mining Industry. It is the result of cooperation between several government departments; Industry, Science and Technology Canada, Canada Centre for Mineral and Energy Technology (CANMET), Communications Canada, and Statistics Canada who conducted this survey. The report was prepared by François Bolduc, Michael Clapham, Don Doyle, Michael Issa, Beverley Mahony and Jay Pathak.

SURVEY OF DIFFUSION OF TECHNOLOGY IN THE MINING INDUSTRY

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INTRODUCTION

The survey of Diffusion of Technology in the Mining Industry is the first national survey conducted by Statistics Canada to measure the degree of utilization of computer based technologies for all mining operations in Canada.

Twenty-eight advanced technologies and applications were surveyed in January 1990. They fell into four general categories: automated material handling; communications and networks; control; and automated processing systems. Respondents were asked to indicate both the use and planned use of the selected technologies, the level of satisfaction in their use as well as an evaluation of the impact of the introduction of these technologies on output, on quality and on costs. The questionnaire was mailed to all 324 known mines in Canada. A response rate of 97% was achieved indicating the great interest of the mining industry in advanced technology. Inactive mines or mines engaged solely in exploration were excluded leaving 235 useable responses.

This survey is a combined effort of Industry, Science and Technology Canada; Canada Centre for Mineral and Energy Technology (CANMET), Communications Canada; and Statistics Canada.

HIGHLIGHTS

- **Use of advanced mining technologies**

  Over half (52%) of operating mines (representing 85.2% of total employment in the mining industry) use at least 5 of the 28 advanced technologies. However when we consider the use of 15 technologies or more the numbers drop significantly to 19% of the mines (accounting for 49% of total employment in the industry). This is illustrated in chart 1.

- **Leading technologies**

  The leading technologies were: programmable logic controllers (78%), automatic bin level measurement (77%), flow density measurement (74%), and analog controllers (72%). This reflects the progression from the analog to the digital techniques.

- **Less used technologies**

  Less frequent use was made of the following technologies: automated T.V. image analysis (19%), on-stream size analysis (28%), near-stream analysis (25%), and open pit data communication networks (24%).

- **Planned use of technologies**

  Respondents were asked to identify if they planned to increase current usage of the technologies surveyed. Significant growth is planned in the next three years in underground data communication networks (64%), programmable logical controllers (50%), supervisory control and data acquisition (49%), integrated expert systems for process control (49%), and on-line statistical process control (48%). Respondents not currently using the technologies identified the following top three technologies they were planning to adopt in the next three years: on-line statistical process control (28%), interactive expert systems for process control (20%), and in-plant data networks linking automated processes (14%).

- **Expectations met or exceeded**

  Overall satisfaction with the technologies surveyed was very high. Over 80% of respondents felt their expectations have been met or exceeded, except for automated bin level measurement where 26% felt their expectations were not met.

- **Use by industry**

  Nickel-copper mines, iron mines, potash mines and copper and copper-zinc mines were the most likely to have introduced advanced technologies. Salt mines, gypsum mines, other metal mines, and other non-metal mines had the lowest incidence of technology use (see chart 2).

- **Use by size of mine**

  Large mines, those employing over 250 employees, made significantly greater use of the technologies, while mines with under 50 employees hardly used the technologies (see chart 3).

- **Use by Province**

  Mining establishments in Ontario, New Brunswick, Saskatchewan, the Northwest Territories, British Columbia and Manitoba had the highest rate of utilization of advanced technologies (see chart 4).

- **Ownership**

  There is no clear overall trend in the use of technologies between Canadian owned mines and mines owned by the United States. However Canadian mines made greater use of control technologies (see chart 5).

- **Age of mine**

  The number of years the mine has been in operation appears to be a factor influencing the use of these technologies. Mines in operation for under 5 years use the technologies less, which reflect the small amount of ores reserves and the use of older refurbished equipment (see chart 6).

- **Impact on output, product quality, and costs**

  Almost two out of three mines (63%) improved their output by introducing the technologies. The highest impact was in iron mines (100%), other metal mines (100%), copper and copper-zinc mines (89%), silver-lead-zinc mines (88%) and potash mines (70%).

  Over one out of every two mines (56%) experienced improved product quality by adopting advanced computer based technologies. This was most evident in the following industries: iron (100%), nickel-copper (100%), copper and copper-zinc (78%), silver-lead-zinc (75%), other metal mines (75%), and uranium mines (71%).

  Almost two out of every three mines surveyed (65%) experienced a reduction in costs by the introduction of the new technologies; in 27% there was no change in costs while in 9% there was an increase in costs. Decreased costs due to technology use were prevalent in the following mining industries: iron (100%), silver-lead-zinc (100%), asbestos (100%), copper and copper-zinc (88%), uranium (86%), potash (82%), and nickel-copper (80%). Five mining industries responded that they had experienced an increase in costs due to the introduction of the new technologies, these were: gypsum (22%), coal (20%), other non-metal (19%) gold (11%), and copper and copper-zinc mines (6%).

  There was a positive correlation between increased use of technology and its beneficial impact on output, quality and costs (see chart 8).

PRESENTATION OF TABLES

The tables are presented in two formats, with each version presented opposite the other. One format presents the results **weighted by mines,** each mine represents one unit irrespective of size. The other table format presents the percentages **weighted by the number of employees** working in the mine. This method adjusts the technology use by the size of the mine's operation as reflected by its employment.

The results were tabulated by industry (Gold, Copper and Copper-Zinc, Nickel-Copper, Silver-Lead-Zinc, Uranium, Iron, Other Metal, Asbestos, Gypsum, Potash, Salt, Other Non-Metal (except coal), and Coal), by province, by mining method, by ownership, by size and by age of operation.

To simplify the presentation of the tables some headings had to be abbreviated, i.e. "plan to use" or "plan to increase usage" refer to **the next three years.** A copy of the questionnaire used is provided on the next page. It shows the complete description of the technologies and applications surveyed as well as the detailed questions asked.

SYMBOLS USED IN THE TABLES

- \- zero
- x confidential

Statistics Canada Statistique Canada

DIFFUSION OF TECHNOLOGY SURVEY IN THE MINING INDUSTRIES

IMPORTANT

Please complete and return within 10 days of receipt.

>> PLEASE REPORT ONLY FOR THE ABOVE SPECIFIED MINING LOCATION.

Collected under Authority of Statistics Act, Revised Statutes of Canada, 1985, Chapter S19.

Si vous préférez recevoir ce questionnaire en français, veuillez téléphoner à frais virés ou cocher la case ☐

PURPOSE OF THE SURVEY

Studies have indicated that Canada lags behind most other advanced economies in the use of computer-based technologies. The purpose of this survey is to provide up-to-date information on the current and planned use of computer-based technologies and applications in the mining industry. This data will be important to the federal government in policy formulation and program planning to promote the diffusion of computer-based technologies.

SPONSOR

This survey is conducted by Statistics Canada on behalf of Industry, Science and Technology Canada, Departments of Communications and Energy, Mines and Resources/CANMET.

PARTICIPATION

Participation in this survey is voluntary. Your cooperation in completing the questionnaire, however, is vital for the statistical information to be useful and valuable.

SCOPE

The manager is asked to provide a single response on the form provided, which is representative of these technologies used in your mining and milling operations.

CONFIDENTIALITY

Statistics Canada is prohibited by law from publishing or releasing outside Statistics Canada, in any manner, any statistics which would divulge information obtained from this survey relating to any identifiable business. The data reported on the survey questionnaire will be treated in strict confidence, used for statistical purposes and released in aggregate form only. The confidentiality provisions of the Statistics Act are not affected by either the Access to Information Act or any other legislation.

CORRESPONDENCE

If you require assistance in the completion of the questionnaire or have any questions regarding the survey, please contact one of the offices below:

St. John's	Montreal	Toronto
1-800-563-4255	1-800-363-6720	1-800-387-0730
(709) 772-4048	(514) 283-5724	(416) 973-6598

Halifax	Sturgeon Falls	Winnipeg
1-800-565-1685	1-800-461-1662	1-800-665-3393
(902) 426-8100	(705) 753-4888	(204) 983-2773

Edmonton	Vancouver
1-800-661-9884	1-800-663-0172
(403) 495-4627	(604) 666-2649

Name of person filling out questionnaire (Please print)	Telephone number Area code

5-4400-2.1: 30-11-89 STC/IND-310-02761

Canada

SECTION A - TECHNOLOGY USE

DO YOU USE ANY OF THE TECHNOLOGIES BELOW?	IF YES					IF NO	
For each of the technologies listed below, mark x in the appropriate column.	Currently used in operations	Plan to increase current usage in next 3 years	Have your expectations of these technologies been: (check one)			Plan to use in next 3 years	
			met	not met	exceeded	Yes	No
1. AUTOMATED MATERIAL HANDLING							
1.01 Automatic bin level measurement feed/withdrawl							
1.02 Automatic conveyer systems: -sequential analog							
-computer control							
1.03 Automatic slurry pumping systems: -stop/select							
-variable speed							
1.04 Automatic computer control handling equipment: -ores							
-slurries							
-concentrates							
-reagents							
1.05 Computer controlled vehicles & equipment							
1.06 Computer based vehicle & equipment maintenance							
2. COMMUNICATIONS & NETWORKS							
2.01 Radio based voice networks: -open pit mines							
-underground mines							
2.02 Data communication networks in open pit mines							
2.03 Underground data communications network							
2.04 In plant data networks linking automated processes							
3. CONTROL							
3.01 Analog controllers							
3.02 Programmable logic controllers (PLC)							
3.03 On-line statistical process control (SPC)							
3.04 Supervisory control & data acquisition (SCADA)							
3.05 Interactive expert systems for process control							
3.06 Automated environmental monitoring & control							
3.07 Automatic T.V. image analysis							
4. AUTOMATED PROCESSING SYSTEMS							
4.01 Near stream analysis							
4.02 On-stream analysis (XRF)							
4.03 On-stream size analysis							
4.04 Flow/density measurement							
4.05 Inventory measurement							

SECTION B - IMPACT

How did the introduction of the new technologies affect the following factors:	Increased	Decreased	No Change
Output			
Product quality			
Costs			

SECTION C - TYPE OF MINING, OWNERSHIP & EMPLOYMENT

1. Mining method: ☐ Selective ☐ Bulk

2. Is this establishment: ☐ Canadian owned ☐ U.S. owned ☐ Other

3. Number of employees at this address: _____

4. Age of mining operation: ☐ 0 - 5 years ☐ 6 - 10 years ☐ 11 - 15 years ☐ 16 - 20 years ☐ over 20 years

Charts

Chart 1. Use of advanced mining technology

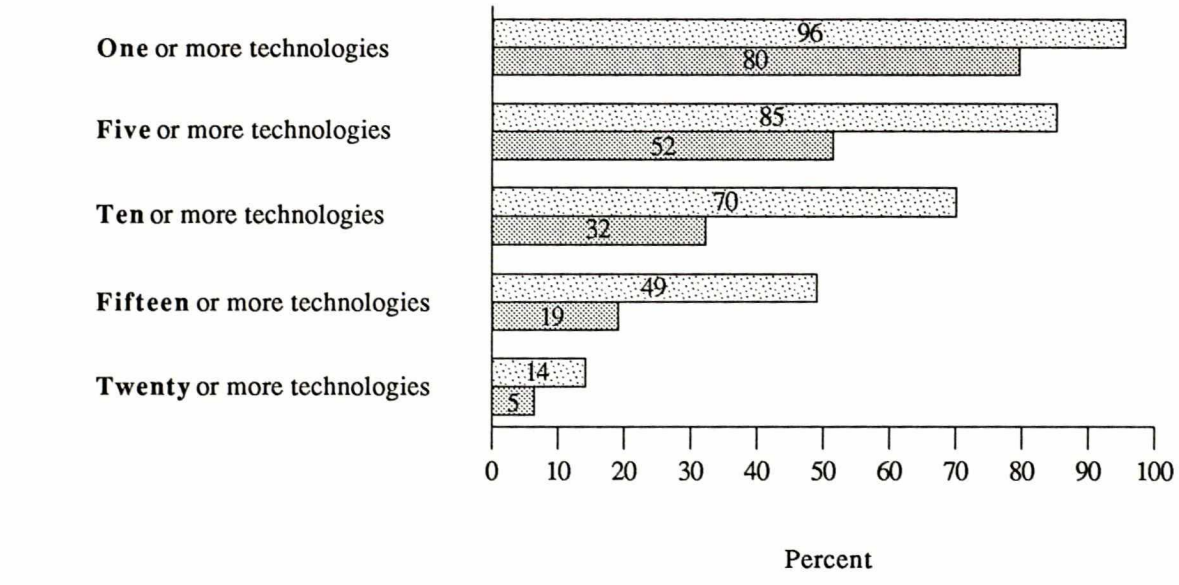


Chart 2. Average number of technologies used by industry

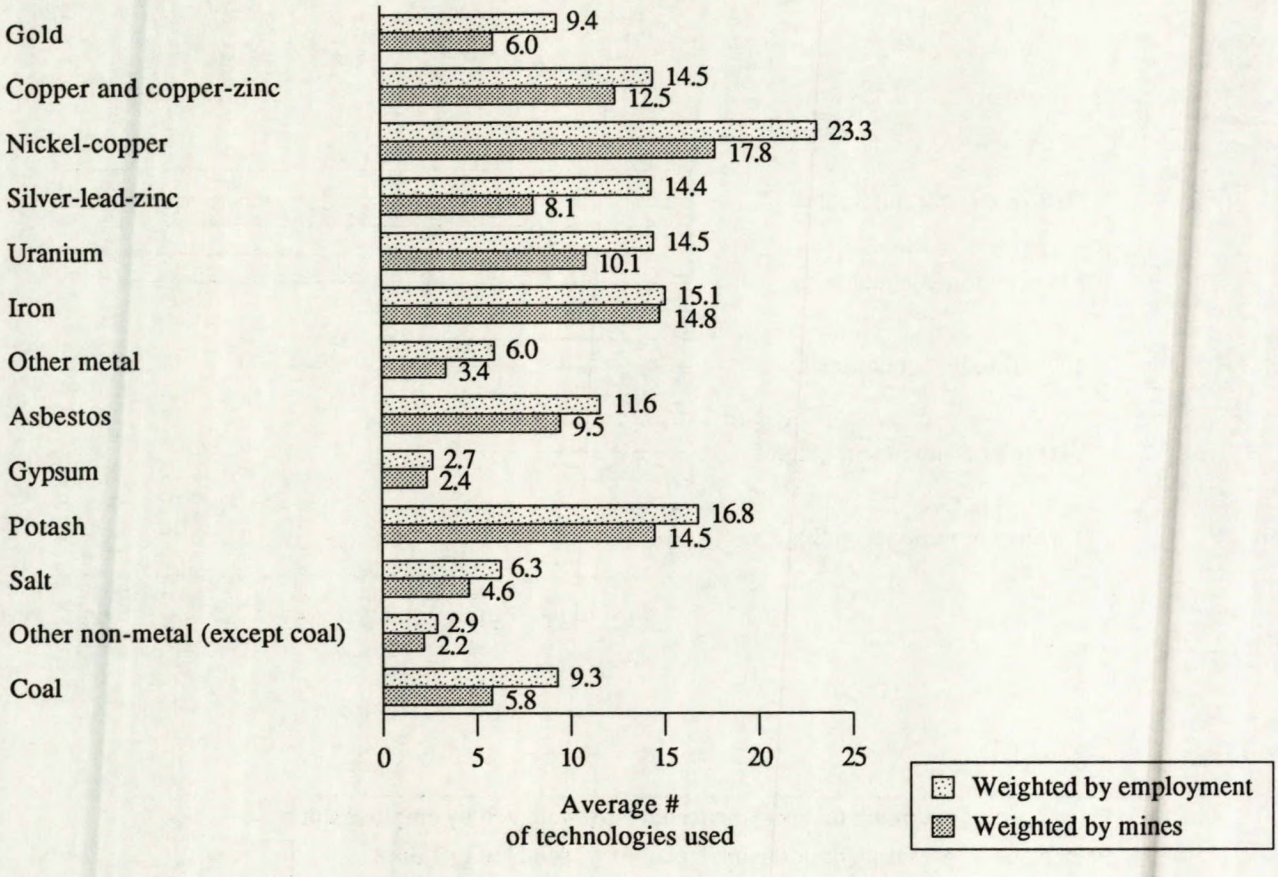


Chart 3. Average number of technologies used by size of mine

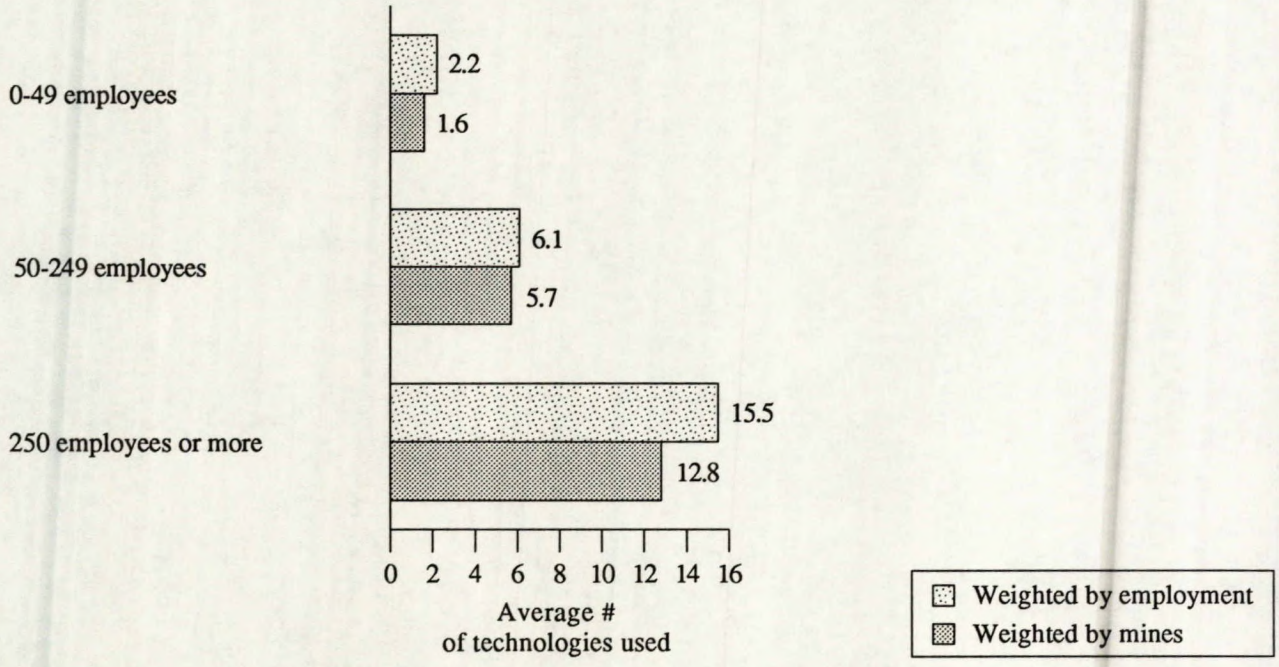


Chart 4. Average number of technologies used by province

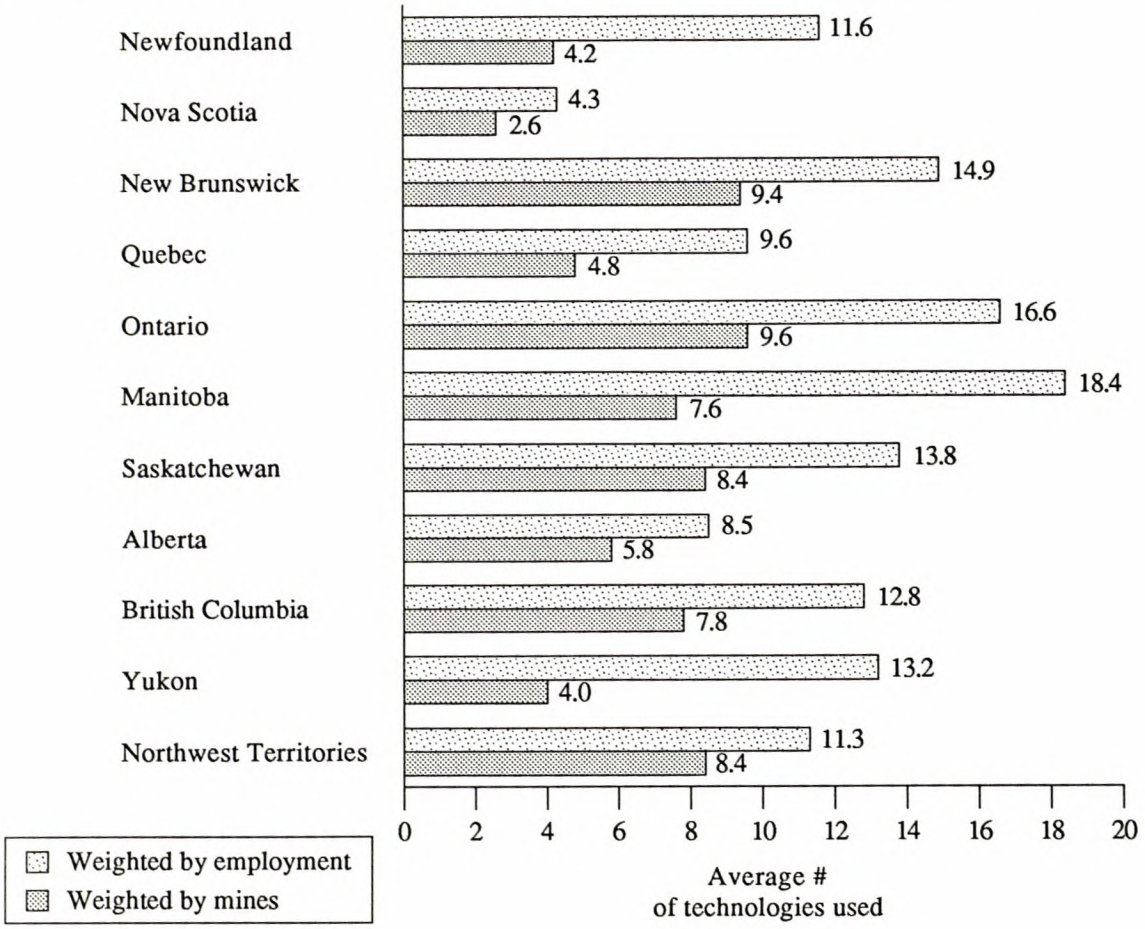


Chart 5. Average number of technologies used by ownership

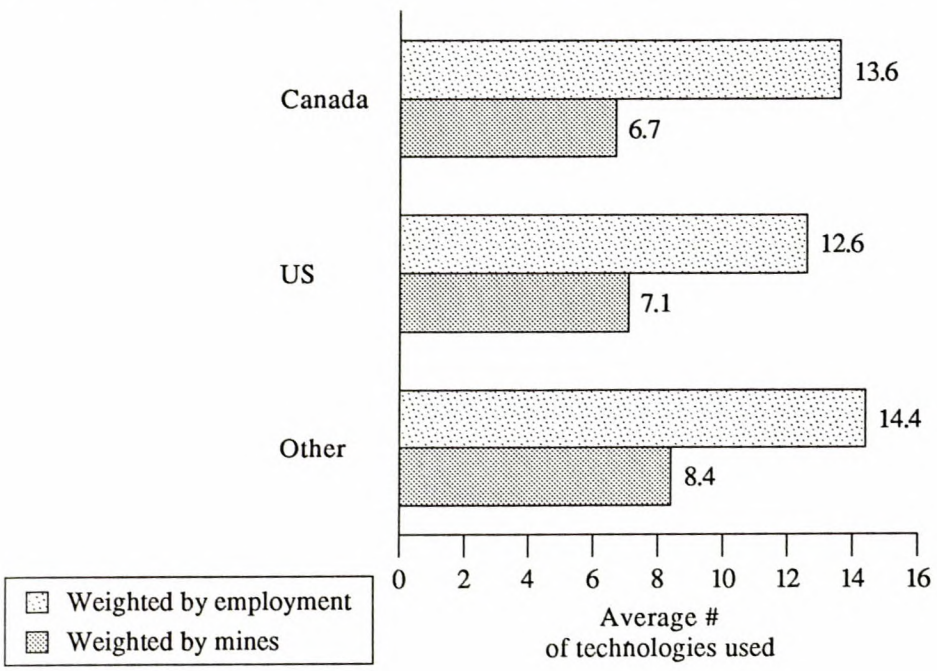


Chart 6. Average number of technologies used by age of mine

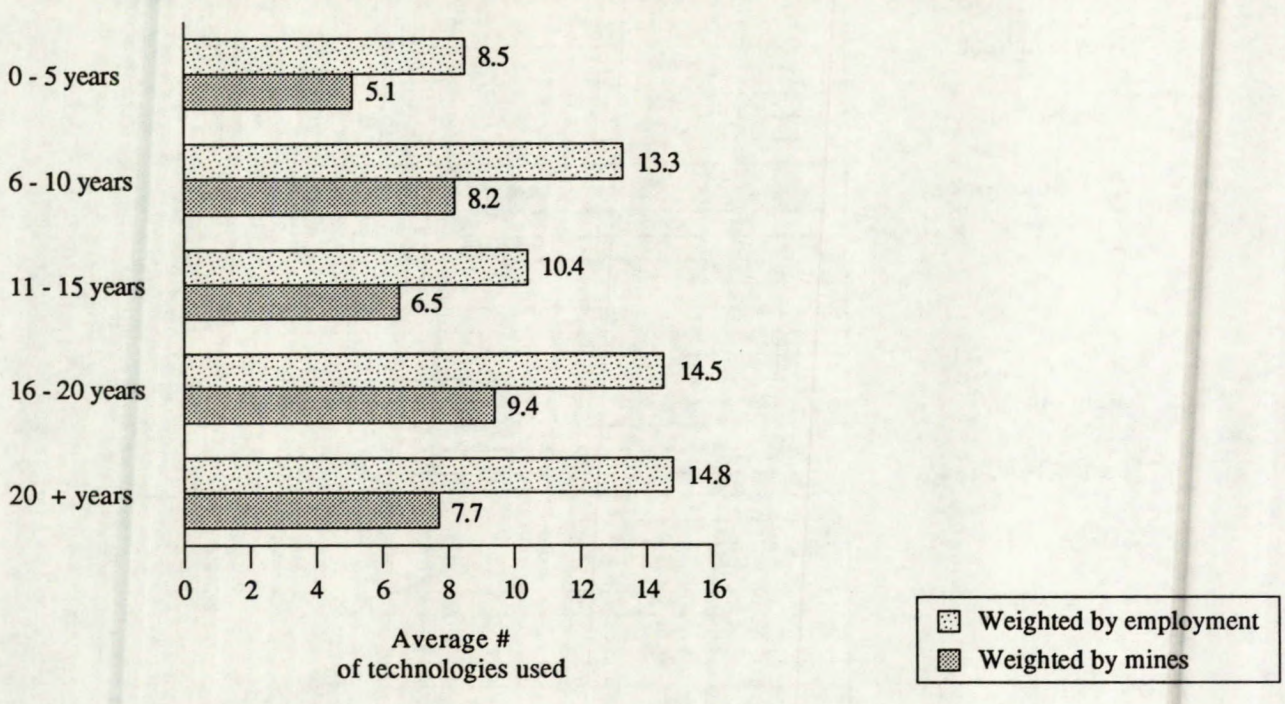


Chart 7. Average number of technologies used by mining method

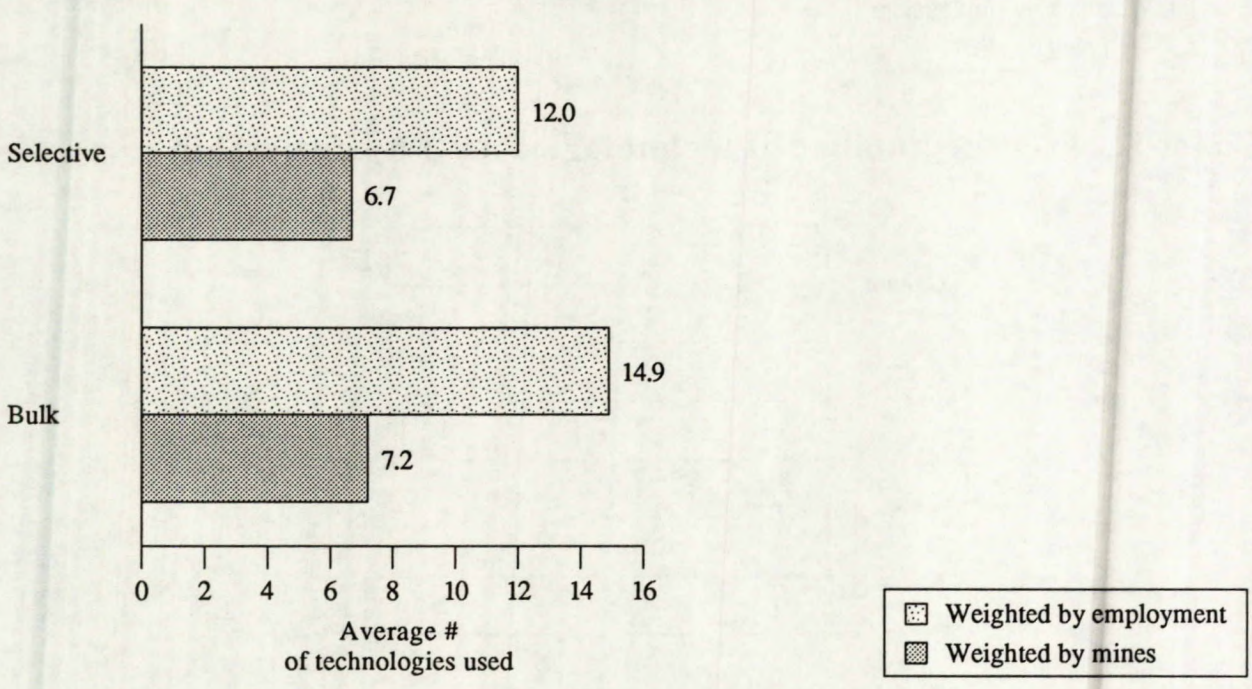


Chart 8. Impact based on the number of technologies introduced

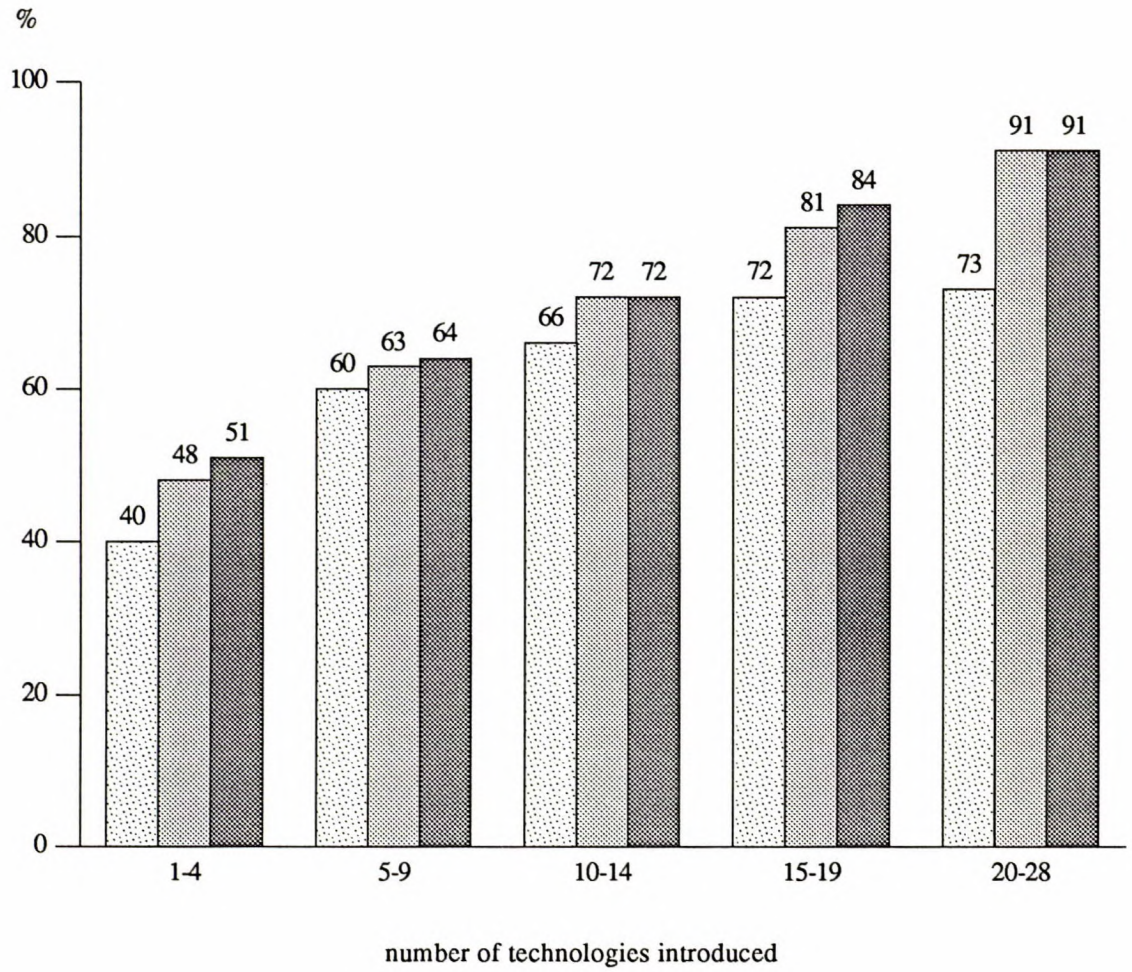


Chart 9. Current and planned use of automated material handling technologies

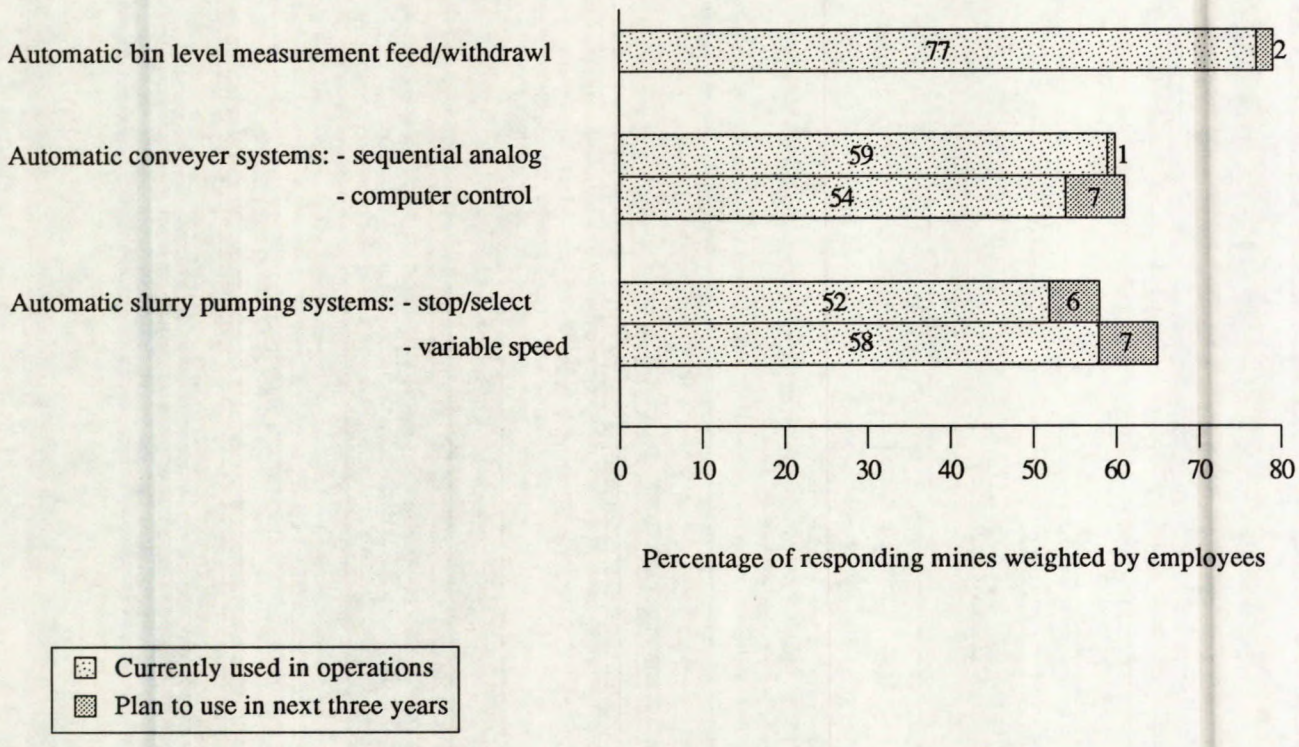


Chart 10. Current and planned use of communications & networks technologies

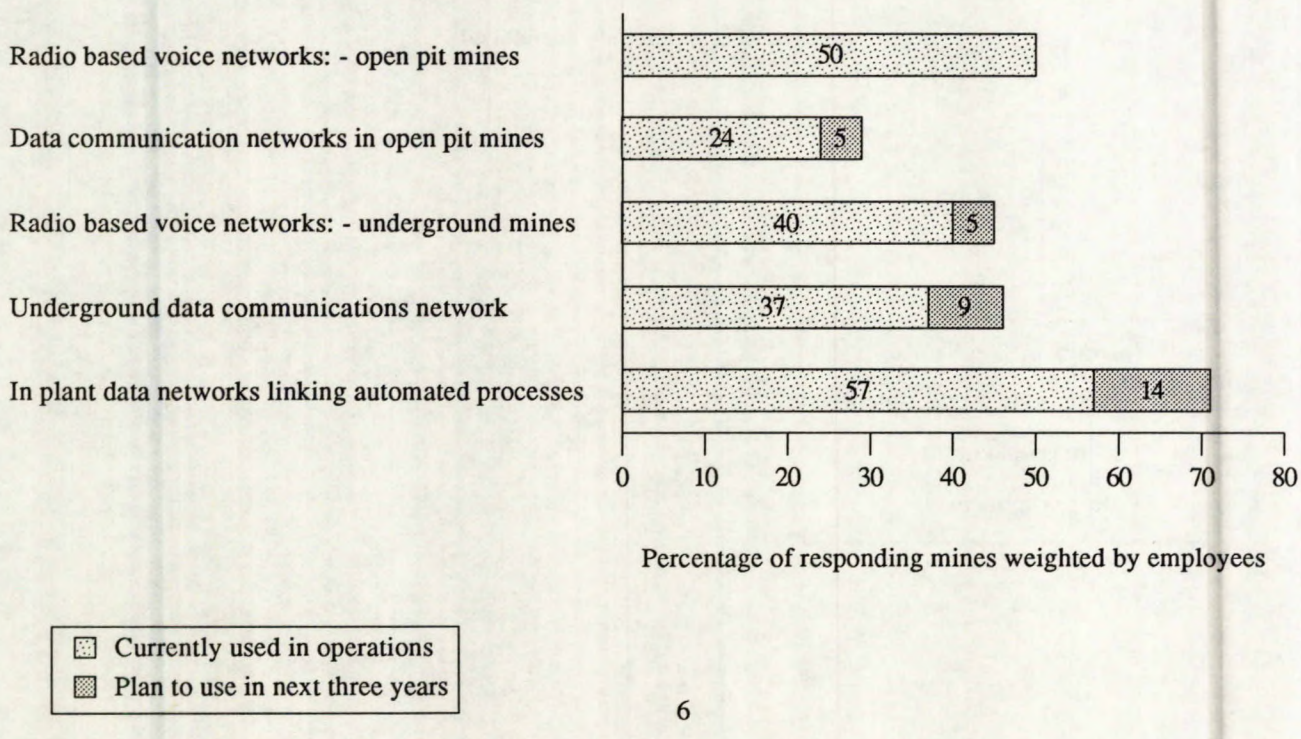


Chart 11. Current and planned use of control technologies

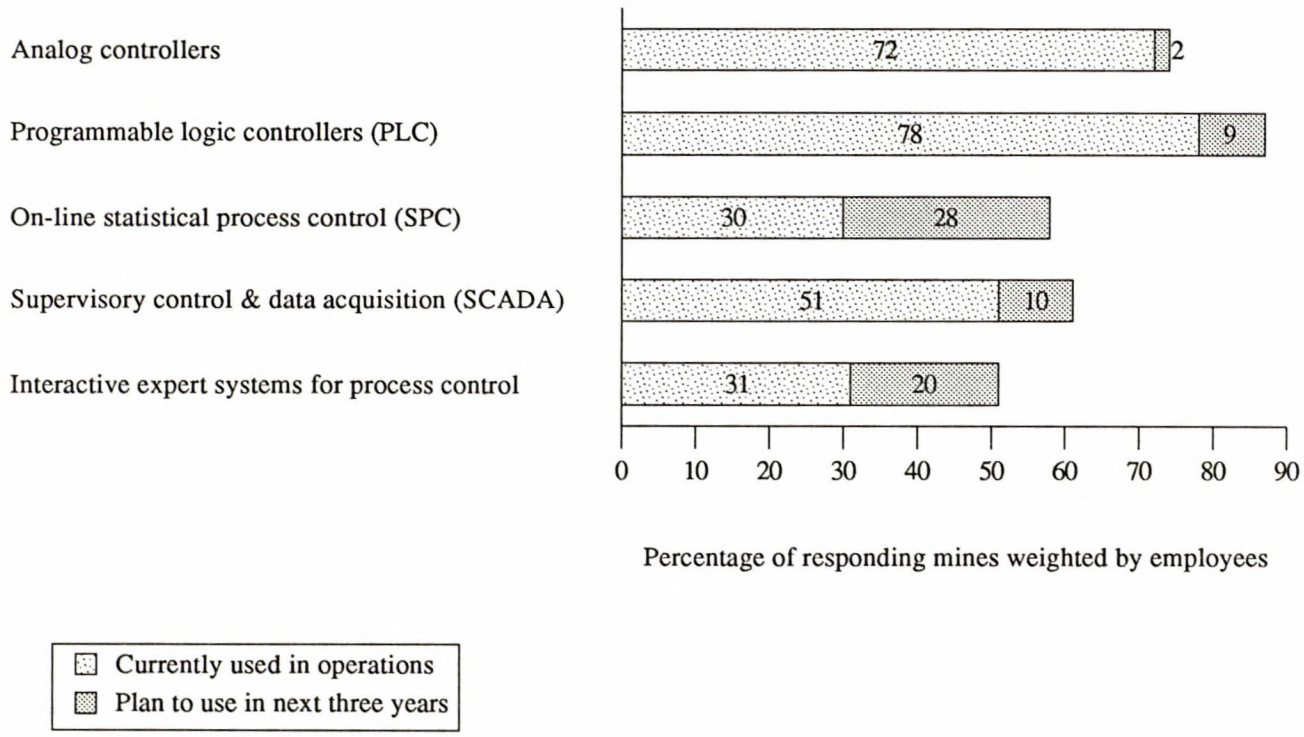


Chart 12. Current and planned use of automated processing systems technologies

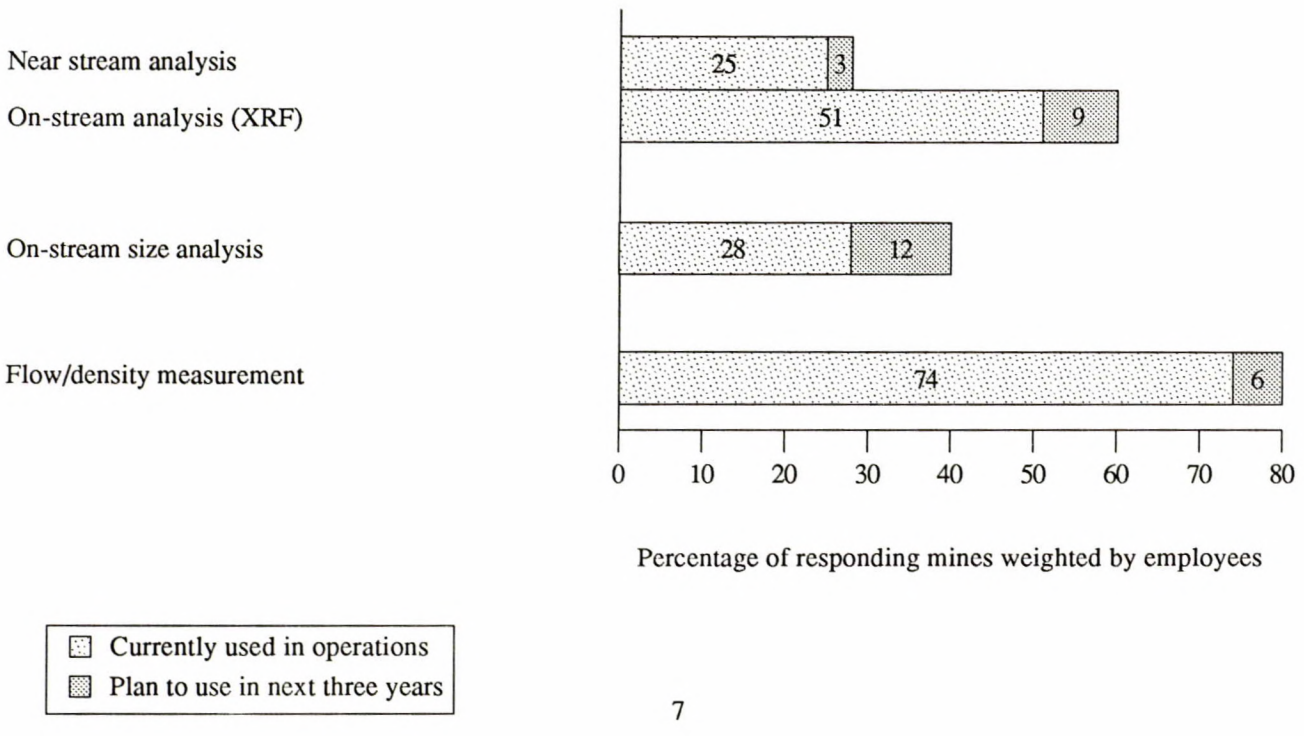


Chart 13. Impact of the introduction of technologies on output by industry

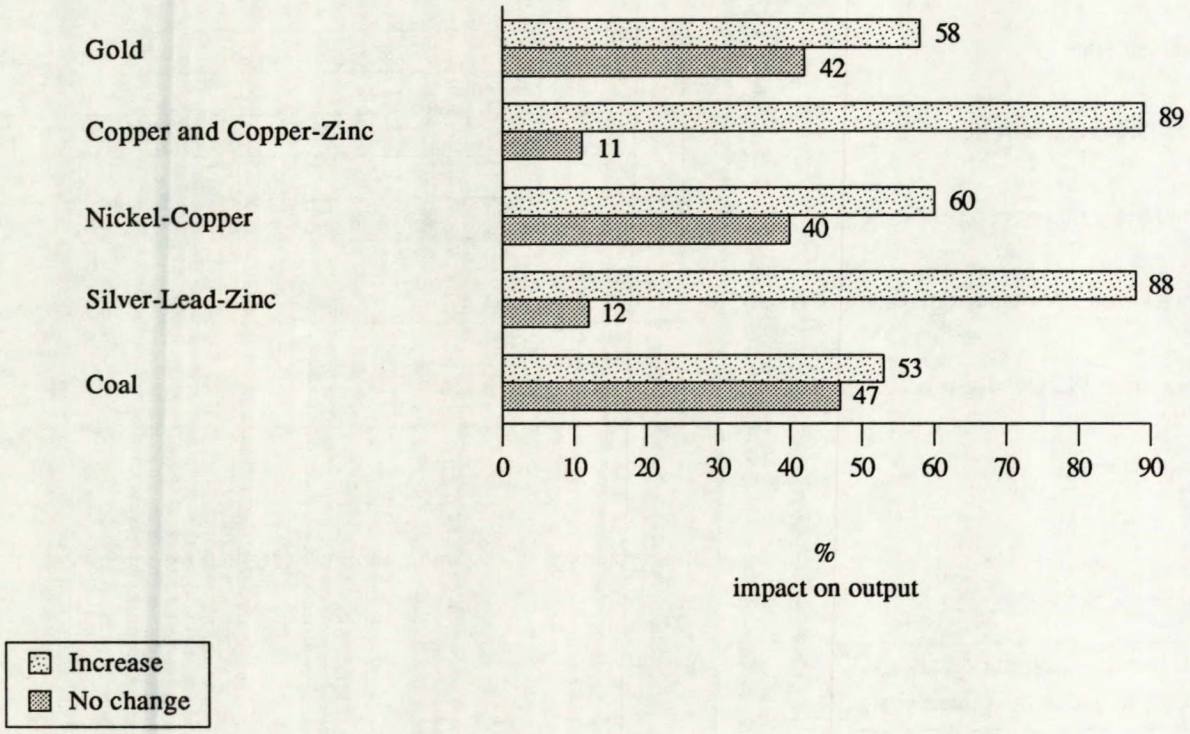


Chart 14. Impact of the introduction of technologies on product quality by industry

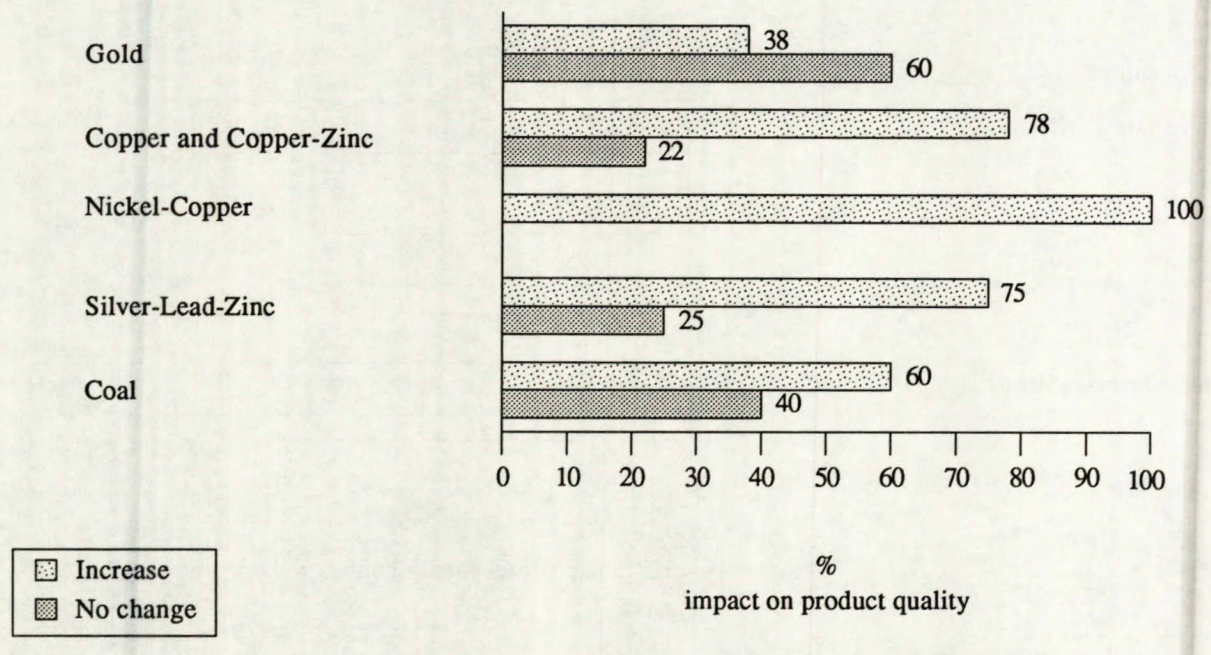


Chart 15. Impact of the introduction of technologies on costs by industry

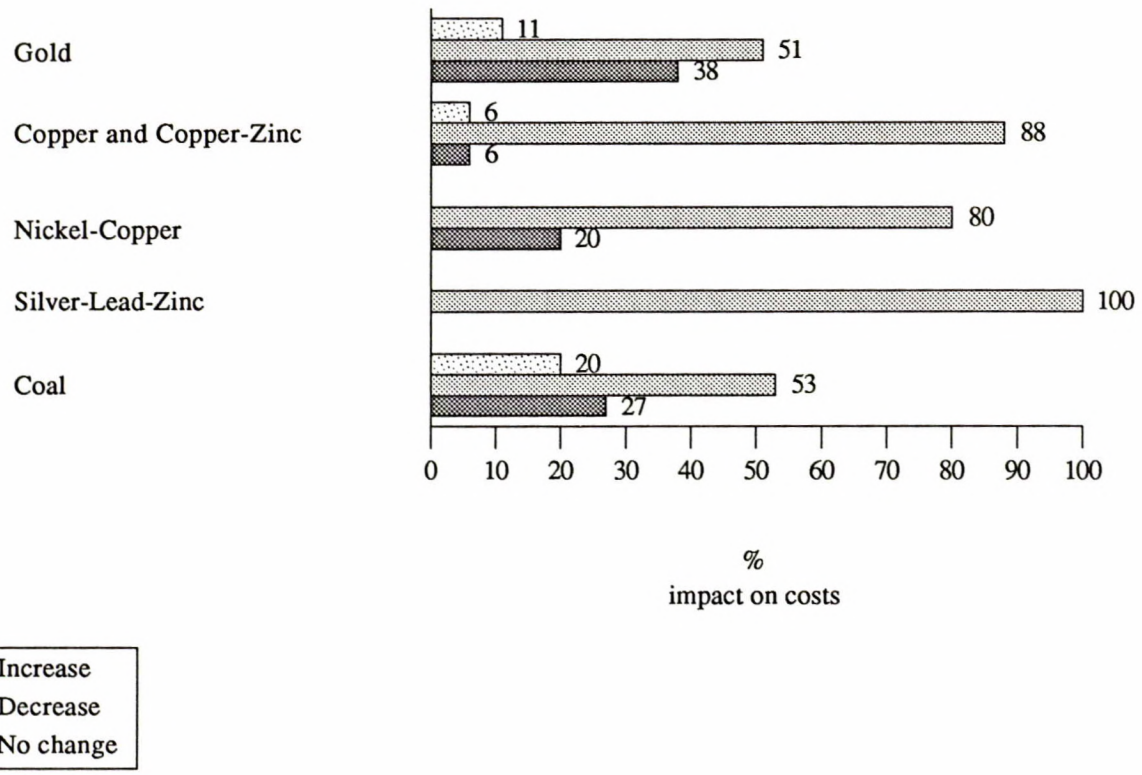


Chart 16. Impact of the introduction of technologies on output by size

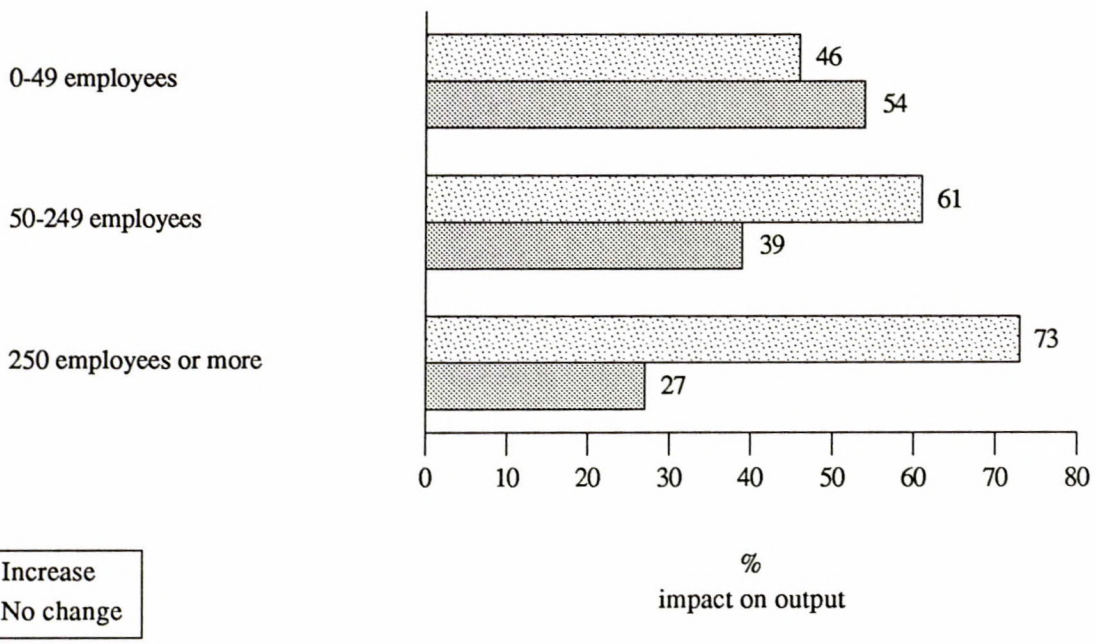


Chart 17. Impact of the introduction of technologies on product quality by size

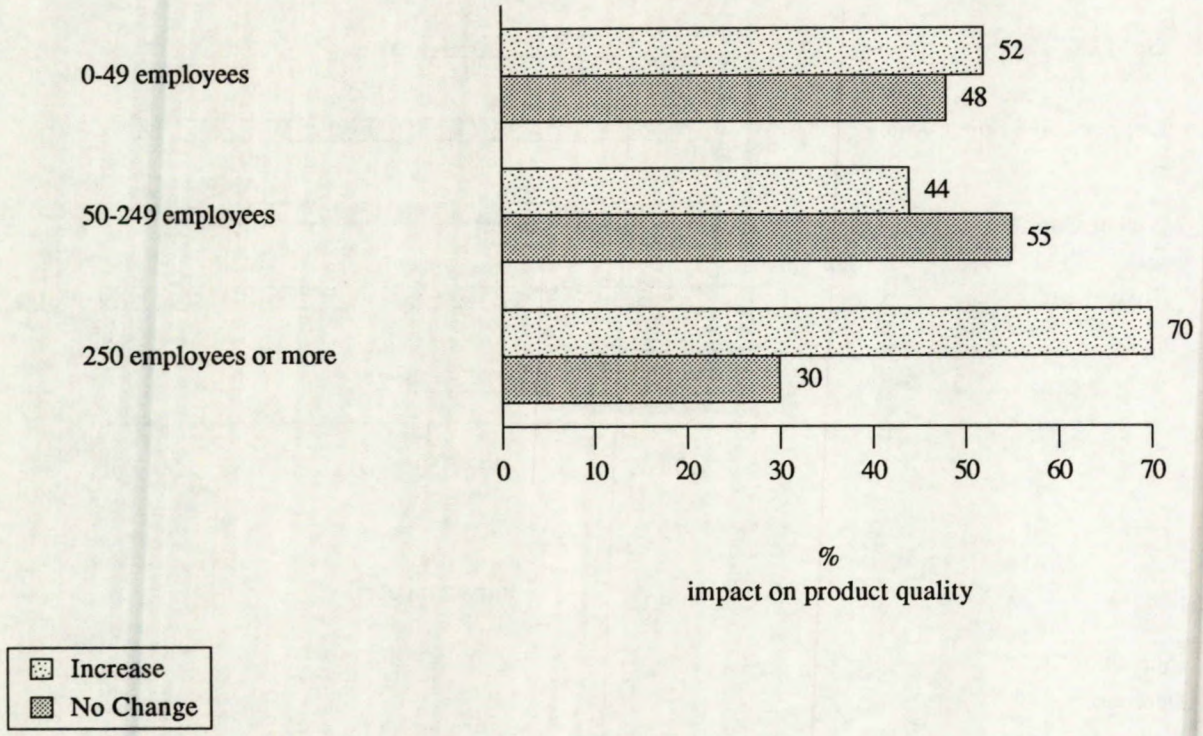


Chart 18. Impact of the introduction of technologies on costs by size

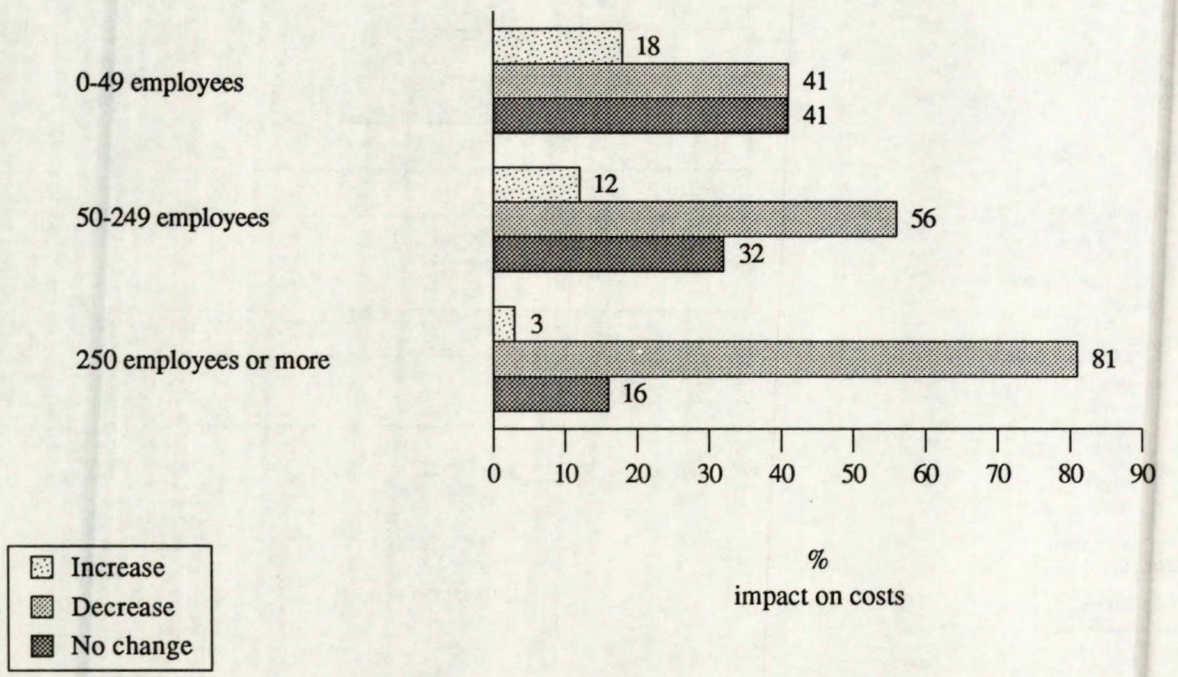


Chart 19. Impact of the introduction of technologies on output by mining method

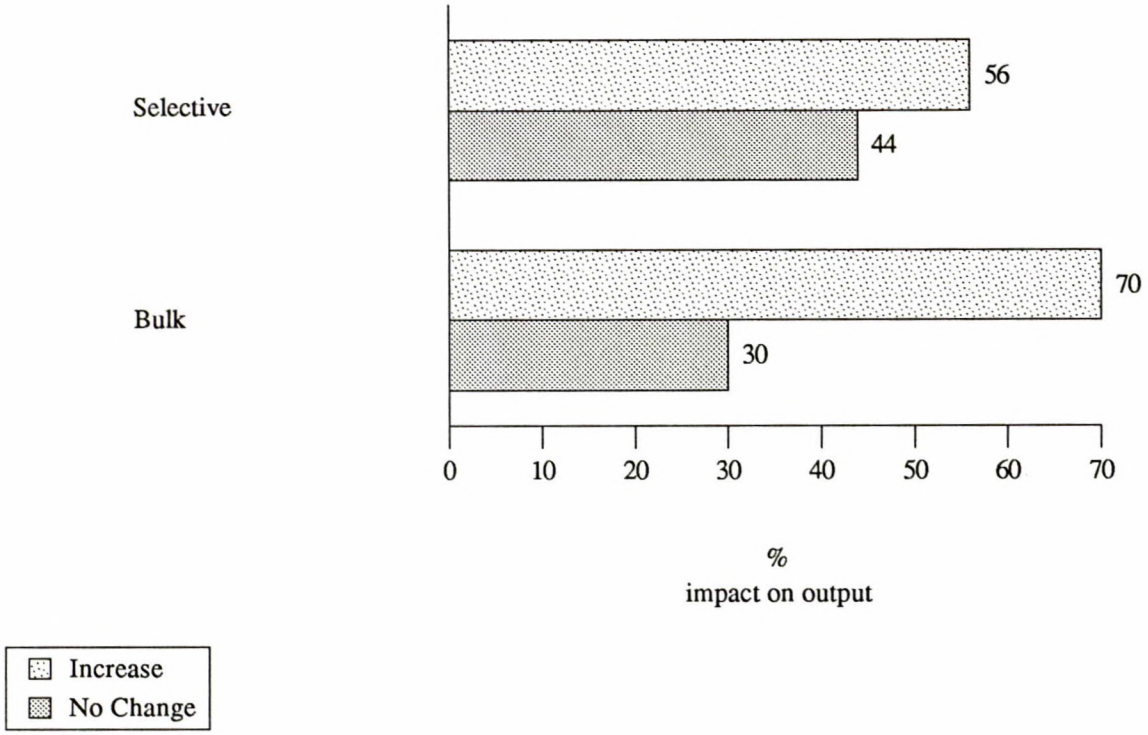


Chart 20. Impact of the introduction of technologies on product quality by mining method

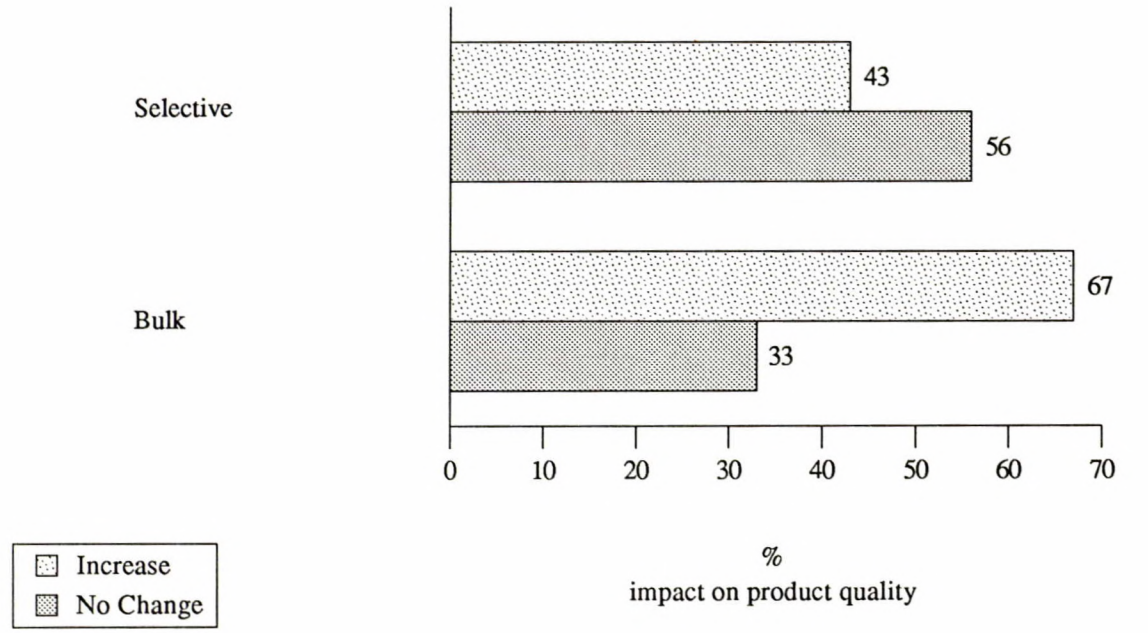
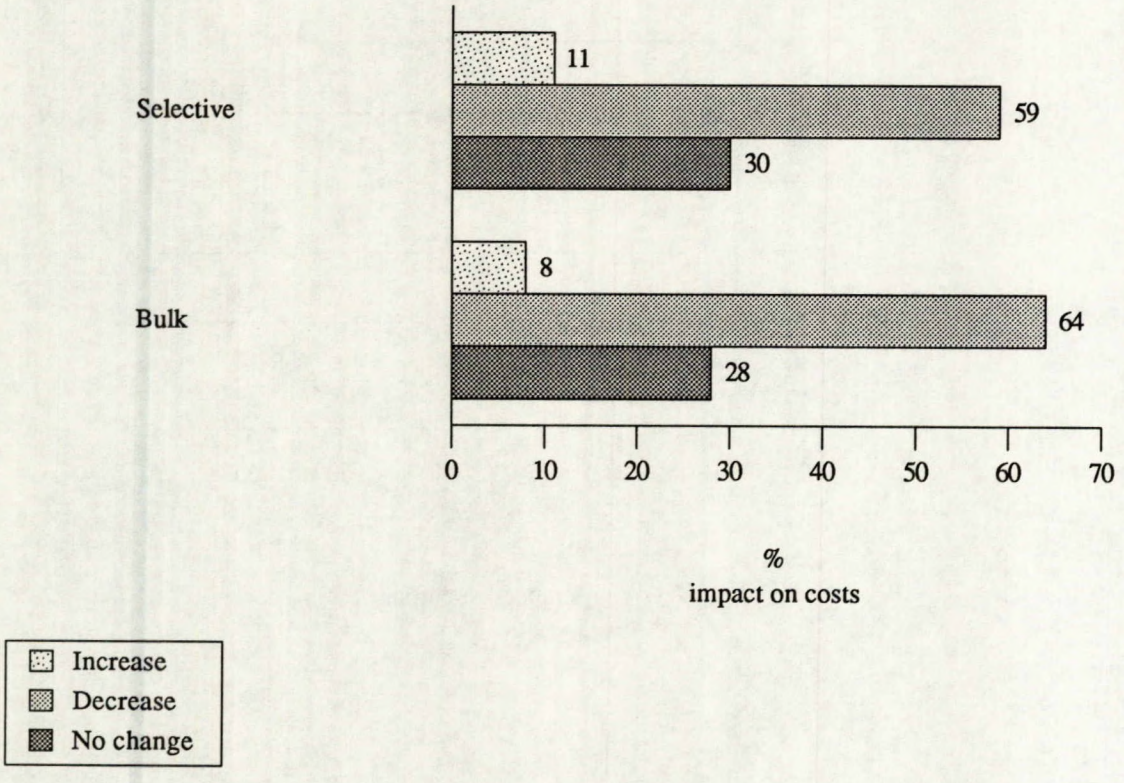


Chart 21. Impact of the introduction of technologies on costs by mining method



Statistical Tables

TABLE 1.1 THE USE OF TECHNOLOGY FOR ALL INDUSTRIES (WEIGHTED BY MINES)

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	47.2	26.1	76.6	14.4	2.7	5.1	47.7
Aut. conveyor - sequential analog	35.3	16.9	86.7	2.4	3.6	2.6	62.1
- computer control	26.8	30.2	85.7	1.6	6.3	8.1	65.1
Aut. slurry pumping - stop select	32.3	15.8	89.5	3.9	1.3	5.5	62.1
- var. speeds	29.8	22.9	85.7	7.1	1.4	9.4	60.9
Aut. handling equip. - ores	27.2	25.0	79.7	3.1	4.7	6.8	66.0
- slurries	26.8	23.8	82.5	6.3	1.6	6.8	66.4
- concentrates	21.3	22.0	84.0	4.0	-	6.4	72.3
- reagents	23.0	33.3	79.6	3.7	1.9	10.2	66.8
Computer controlled vehicle & equip.	13.2	35.5	64.5	9.7	3.2	10.6	76.2
Comp. based vehicle & equip. maintenance	29.4	33.3	66.7	18.8	1.4	11.9	58.7
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	34.0	6.3	67.5	8.8	1.3	1.7	64.3
- underground	17.0	17.5	70.0	12.5	-	7.7	75.3
Data communication networks - open pit	9.4	22.7	77.3	4.5	4.5	3.8	86.8
Underground data communication networks	15.7	35.1	75.7	-	5.4	7.7	76.6
In plant data networks linking aut. processes	26.0	34.4	82.0	3.3	4.9	10.6	63.4
CONTROL							
Analog controllers	45.1	19.8	78.3	4.7	3.8	4.3	50.6
Programmable logic controllers (PLC)	51.1	38.3	75.8	4.2	8.3	9.8	39.1
On-line statistical process control	15.3	38.9	80.6	-	8.3	16.6	68.1
Supervisory control & data acquisition	22.1	42.3	84.6	3.8	-	11.5	66.4
Int. expert systems for process control	11.1	46.2	76.9	7.7	3.8	11.5	77.4
Aut. environmental monitoring & control	25.1	27.1	74.6	8.5	5.1	8.9	66.0
Automated T.V. image analysis	8.5	20.0	70.0	5.0	-	3.8	87.7
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	11.9	25.0	92.9	3.6	-	4.7	83.4
On-stream analysis (XRF)	22.1	38.5	86.5	-	-	6.8	71.1
On-stream size analysis	8.9	14.3	57.1	14.3	4.8	6.8	84.3
Flow density measurement	41.7	22.4	81.6	5.1	1.0	8.1	50.2
Inventory measurement	23.4	20.0	72.7	10.9	3.6	6.8	69.8

TABLE 1.2 THE USE OF TECHNOLOGY FOR ALL INDUSTRIES (WEIGHTED BY EMPLOYEES)

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	77.0	32.8	68.8	25.6	2.4	2.2	20.8
Aut. conveyor - sequential analog	59.1	16.6	92.1	1.1	1.5	1.4	39.4
- computer control	54.1	37.3	93.0	0.8	3.6	7.4	38.5
Aut. slurry pumping - stop select	52.0	27.8	93.0	2.0	1.5	6.1	42.0
- var. speeds	58.3	35.5	91.0	4.7	1.2	6.9	34.8
Aut. handling equip. - ores	59.1	30.7	76.7	5.2	6.9	6.5	34.4
- slurries	58.3	25.5	76.6	10.9	4.5	5.8	35.9
- concentrates	47.9	29.1	81.0	7.0	-	6.1	46.0
- reagents	52.0	32.6	86.1	2.4	1.5	11.1	36.9
Computer controlled vehicle & equipment	34.0	38.5	47.5	7.0	21.5	10.4	55.6
Comp. based vehicle & equip. maintenance	51.0	33.3	62.3	11.4	14.3	9.7	39.3
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	50.4	3.6	70.8	7.8	0.3	0.3	49.2
- underground	39.5	29.6	81.0	4.4	-	4.7	55.9
Data communication networks - open pit	24.0	19.6	93.8	1.8	2.9	4.6	71.3
Underground data communication networks	37.0	63.6	65.7	-	21.6	8.9	54.2
In plant data networks linking aut. proc.	56.8	37.9	73.3	2.1	15.0	14.1	29.1
CONTROL							
Analog controllers	71.7	21.0	84.3	4.0	3.1	2.1	26.1
Programmable logic controllers (PLC)	77.5	49.5	85.7	2.1	4.8	8.8	13.7
On-line statistical process control	30.0	47.6	94.2	-	3.0	27.6	42.4
Supervisory control & data acquisition	51.1	49.2	92.0	3.8	-	9.9	39.0
Int. expert systems for process control	30.6	49.0	75.0	11.9	1.4	19.6	49.7
Aut. environmental monitoring & control	56.0	36.2	82.4	7.1	6.3	9.2	34.9
Automated T.V. image analysis	19.1	17.5	68.6	7.7	-	3.1	77.9
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	24.6	18.7	91.0	6.0	-	2.7	72.8
On-stream analysis (XRF)	51.3	34.5	89.5	-	-	8.5	40.2
On-stream size analysis	28.0	8.3	65.3	17.2	0.6	12.2	59.8
Flow density measurement	74.2	22.0	84.7	6.4	0.6	6.4	19.4
Inventory measurement	41.6	25.4	70.5	15.4	2.9	10.2	48.1

TABLE 2.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Technologies	Currently use												
	Gold	Copper- & Copp. Zinc	Nickel-Copper	Silver-Lead-Zinc	Uranium	Iron	Other Metal	Asbestos	Gypsum	Potash	Salt	Other Non-Metal	Coal
AUTOMATED MATERIAL HANDLING													
Automatic bin level measurement	39.2	54.5	80.0	43.8	66.7	100.0	25.0	75.0	33.3	90.9	54.5	30.3	47.4
Aut. conveyor - sequential analog	27.0	54.5	60.0	31.3	44.4	62.5	25.0	50.0	26.7	72.7	27.3	27.3	31.6
- computer control	24.3	45.5	60.0	25.0	11.1	75.0	-	50.0	13.3	90.9	18.2	3.0	21.1
Aut. slurry pumping - stop select	31.1	40.9	60.0	37.5	77.8	75.0	12.5	25.0	6.7	72.7	18.2	6.1	36.8
- var. speeds	29.7	59.1	80.0	37.5	44.4	75.0	12.5	-	6.7	54.5	9.1	3.0	26.3
Aut. handling equip. - ores	23.0	59.1	80.0	25.0	44.4	75.0	12.5	75.0	-	63.6	18.2	3.0	10.5
- slurries	23.0	68.2	80.0	37.5	55.6	62.5	12.5	-	-	54.5	-	-	21.1
- concentrates	16.2	45.5	80.0	37.5	22.2	50.0	-	50.0	-	63.6	9.1	3.0	5.3
- reagents	23.0	59.1	80.0	25.0	55.6	37.5	12.5	-	-	63.6	-	-	-
Computer controlled vehicle & equipment	8.1	31.8	40.0	6.3	22.2	37.5	-	50.0	-	9.1	9.1	9.1	15.8
Comp. based vehicle & equip. maintenance	28.4	59.1	40.0	31.3	44.4	37.5	12.5	-	6.7	45.5	18.2	12.1	42.1
COMMUNICATIONS & NETWORKS													
Radio based voice networks - open pit	24.3	63.6	40.0	18.8	22.2	62.5	25.0	100.0	46.7	27.3	-	21.2	68.4
- underground	17.6	36.4	80.0	18.8	33.3	-	-	25.0	-	36.4	9.1	3.0	10.5
Data communication networks - open pit	2.7	18.2	20.0	6.3	-	50.0	-	25.0	6.7	18.2	-	3.0	26.3
Underground data communication networks	18.9	36.4	80.0	18.8	33.3	-	12.5	-	-	27.3	-	3.0	-
In plant data networks linking aut. processes	21.6	45.5	80.0	18.8	66.7	62.5	12.5	25.0	-	63.6	27.3	6.1	15.8
CONTROL													
Analog controllers	39.2	59.1	80.0	50.0	55.6	87.5	25.0	75.0	20.0	81.8	54.5	24.2	47.4
Programmable logic controllers (PLC)	44.6	59.1	80.0	50.0	55.6	87.5	37.5	75.0	33.3	100.0	90.9	21.2	57.9
On-line statistical process control	12.2	18.2	60.0	25.0	22.2	37.5	-	-	-	54.5	-	9.1	10.5
Supervisory control & data acquisition	14.9	40.9	80.0	43.8	33.3	50.0	12.5	25.0	-	72.7	18.2	3.0	5.3
Int. expert systems for process control	6.8	13.6	60.0	18.8	44.4	37.5	-	50.0	-	-	-	6.1	5.3
Aut. environmental monitoring & control	21.6	31.8	80.0	43.8	55.6	37.5	12.5	75.0	-	45.5	27.3	-	26.3
Automated T.V. image analysis	8.1	22.7	20.0	-	-	37.5	-	-	-	27.3	-	6.1	-
AUTOMATED PROCESSING SYSTEMS													
Near-stream analysis	13.5	9.1	20.0	6.3	22.2	62.5	-	-	13.3	36.4	-	3.0	-
On-stream analysis (XRF)	8.1	72.7	80.0	56.3	33.3	37.5	37.5	25.0	-	45.5	9.1	-	5.3
On-stream size analysis	5.4	36.4	40.0	18.8	22.2	12.5	-	-	-	9.1	-	-	-
Flow density measurement	43.2	68.2	80.0	50.0	55.6	100.0	25.0	50.0	6.7	81.8	27.3	9.1	31.6
Inventory measurement	20.3	45.5	60.0	25.0	44.4	25.0	12.5	25.0	20.0	45.5	18.2	6.1	15.8

TABLE 2.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Technologies	Currently use												
	Gold	Copper- & Copp. Zinc	Nickel-Copper	Silver-Lead-Zinc	Uranium	Iron	Other Metal	Asbestos	Gypsum	Potash	Salt	Other Non-Metal	Coal
AUTOMATED MATERIAL HANDLING													
Automated bin level measurement	61.2	63.7	99.8	80.0	86.0	100.0	35.5	87.9	26.6	96.8	36.6	36.8	86.9
Aut. conveyor - sequential analog	37.4	56.5	75.5	75.3	72.7	74.0	35.5	74.1	21.3	78.9	24.9	31.7	55.8
- computer control	44.8	62.6	90.4	45.7	9.0	56.8	-	74.1	14.2	95.8	15.1	7.4	36.6
Aut. slurry pumping - stop select	53.0	37.7	52.6	44.9	86.9	56.3	24.5	50.3	11.8	71.4	5.5	6.7	74.5
- var speeds	46.0	66.5	99.8	67.7	71.2	84.5	24.5	-	11.8	49.5	3.5	4.5	37.4
Aut. handling equip. - ores	39.7	63.1	99.8	27.5	74.9	85.0	24.5	87.9	-	76.0	19.8	7.4	28.1
- slurries	39.6	66.5	99.8	77.9	72.1	78.2	24.5	-	-	72.8	-	-	37.4
- concentrates	23.9	51.4	99.8	44.9	41.1	41.3	-	74.1	-	77.0	13.1	3.5	22.8
- reagents	35.2	78.8	99.8	63.9	75.7	30.8	24.5	-	-	77.0	-	-	-
Computer controlled vehicle & equipment	15.3	34.6	66.1	11.4	47.5	61.1	-	37.6	-	25.3	6.7	8.8	30.3
Comp. based vehicle & equip. maintenance	47.2	75.8	56.6	57.1	45.4	34.7	24.5	-	2.4	59.7	44.3	21.7	53.2
COMMUNICATIONS & NETWORKS													
Radio based voice networks - open pit	28.8	61.6	66.1	18.3	6.9	77.7	59.2	100.0	64.8	32.7	-	26.8	88.0
- underground	32.1	56.8	90.6	37.6	34.3	-	-	50.3	-	29.2	6.7	4.5	7.7
Data communication networks - open pit	2.4	14.5	47.2	5.7	-	71.1	-	50.3	8.3	7.4	-	0.4	55.9
Underground data communication networks	32.7	38.5	90.6	60.4	49.8	-	17.1	-	-	42.4	-	9.5	-
In plant data networks linking aut. processes	39.5	60.7	99.8	46.8	89.6	49.7	24.5	23.8	-	77.0	49.6	8.5	29.5
CONTROL													
Analog controllers	57.0	66.7	99.8	85.9	85.4	63.1	35.5	87.9	26.4	79.8	71.2	29.8	59.3
Programmable logic controllers (PLC)	65.2	67.9	99.8	62.1	61.4	82.5	70.1	87.9	37.0	100.0	97.3	31.9	89.8
On-line statistical process control	21.5	9.3	75.5	35.3	23.8	50.3	-	-	-	66.9	-	9.5	9.4
Supervisory control & data acquisition	24.4	57.9	99.8	83.6	70.1	43.5	24.5	23.8	-	80.2	42.8	7.4	0.7
Int. expert systems for process control	10.5	24.4	75.5	46.8	35.1	54.1	-	74.1	-	-	-	6.1	0.6
Aut. environmental monitoring & control	31.1	43.0	99.8	82.2	85.4	33.0	24.5	87.9	-	64.6	56.5	-	39.6
Automated T.V. image analysis	11.9	23.9	47.2	-	-	34.7	-	-	-	46.1	-	6.7	-
AUTOMATED PROCESSING SYSTEMS													
Near-stream analysis	23.6	6.2	47.2	6.8	31.6	78.4	-	-	8.0	52.0	-	4.5	-
On-stream analysis (XRF)	14.9	88.9	99.8	88.3	32.5	19.7	76.2	23.8	-	56.8	40.8	-	16.7
On-stream size analysis	11.6	43.8	71.5	43.4	3.5	36.9	-	-	-	25.3	-	-	-
Flow density measurement	60.6	83.3	99.8	89.0	81.7	100.0	35.5	37.6	8.3	79.7	45.5	9.2	57.8
Inventory measurement	28.0	43.2	75.5	48.0	72.7	17.3	11.0	23.8	31.9	55.6	53.9	9.8	10.5

TABLE 3.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Gold Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	39.2	24.1	82.8	6.9	3.4	6.8	54.1
Aut. conveyor - sequential analog	27.0	15.0	85.0	-	10.0	5.4	67.6
- computer control	24.3	16.7	72.2	-	11.1	4.1	71.6
Aut. slurry pumping - stop select	31.1	8.7	82.6	4.3	-	5.4	63.5
- var. speeds	29.7	18.2	77.3	4.5	4.5	10.8	59.5
Aut. handling equip. - ores	23.0	17.6	88.2	-	-	6.8	70.3
- slurries	23.0	11.8	94.1	-	-	5.4	71.6
- concentrates	16.2	8.3	91.7	-	-	6.8	77.0
- reagents	23.0	23.5	82.4	-	-	9.5	67.6
Computer controlled vehicle & equipment	8.1	33.3	66.7	16.7	-	12.2	79.7
Comp. based vehicle & equip. maintenance	28.4	23.8	47.6	33.3	-	10.8	60.8
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	24.3	5.6	50.0	16.7	-	1.4	74.3
- underground	17.6	15.4	53.8	23.1	-	10.8	71.6
Data communication networks - open pit	2.7	-	50.0	-	-	2.7	94.6
Underground data communication networks	18.9	28.6	78.6	-	7.1	10.8	70.3
In plant data networks linking aut. processes	21.6	31.3	75.0	6.3	-	5.4	73.0
CONTROL							
Analog controllers	39.2	20.7	65.5	10.3	6.9	5.4	55.4
Programmable logic controllers (PLC)	44.6	27.3	60.6	15.2	6.1	12.2	43.2
On-line statistical process control	12.2	33.3	88.9	-	-	9.5	78.4
Supervisory control & data acquisition	14.9	36.4	81.8	-	-	12.2	73.0
Int. expert systems for process control	6.8	20.0	80.0	20.0	-	6.8	86.5
Aut. environmental monitoring & control	21.6	25.0	68.8	18.8	-	9.5	68.9
Automated T.V. image analysis	8.1	-	83.3	-	-	4.1	87.8
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	13.5	20.0	90.0	-	-	6.8	79.7
On-stream analysis (XRF)	8.1	33.3	83.3	-	-	8.1	83.8
On-stream size analysis	5.4	-	75.0	-	-	6.8	87.8
Flow density measurement	43.2	15.6	75.0	9.4	-	6.8	50.0
Inventory measurement	20.3	13.3	93.3	-	-	5.4	74.3

TABLE 3.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Gold Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	61.2	31.2	84.4	4.9	2.8	3.6	35.2
Aut. conveyor - sequential analog	37.4	10.1	83.6	-	5.8	5.4	57.2
- computer control	44.8	13.8	75.5	-	9.9	3.8	51.4
Aut. slurry pumping - stop select	53.0	4.2	82.8	3.8	-	3.4	43.6
- var. speeds	46.0	11.1	76.0	0.8	7.7	10.6	43.3
Aut. handling equip. - ores	39.7	15.5	84.2	-	-	5.9	54.4
- slurries	39.6	6.1	94.2	-	-	5.2	55.2
- concentrates	23.9	6.4	83.4	-	-	6.7	69.4
- reagents	35.2	13.6	81.5	-	-	11.8	53.0
Computer controlled vehicle & equipment	15.3	23.8	63.7	10.4	-	9.8	74.9
Comp. based vehicle & equip. maintenance	47.2	17.6	49.3	33.6	-	8.7	44.1
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	28.8	0.4	66.3	6.8	-	-	71.2
- underground	32.1	8.3	52.2	22.7	-	12.6	55.3
Data communication networks - open pit	2.4	-	44.4	-	-	2.2	95.3
Underground data communication networks	32.7	39.8	74.8	-	10.8	15.5	51.8
In plant data networks linking aut. proc.	39.5	31.1	72.1	4.1	-	3.4	57.1
CONTROL							
Analog controllers	57.0	18.5	58.2	12.9	9.3	7.9	35.1
Programmable logic controllers (PLC)	65.2	22.1	66.4	13.0	3.1	15.4	19.4
On-line statistical process control	21.5	39.3	98.9	-	-	8.4	70.1
Supervisory control & data acquisition	24.4	40.7	82.6	-	-	11.6	64.0
Int. expert systems for process control	10.5	12.1	92.4	7.6	-	6.9	82.6
Aut. environmental monitoring & control	31.1	28.8	76.8	11.8	-	11.9	57.0
Automated T.V. image analysis	11.9	-	66.7	-	-	3.6	84.5
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	23.6	10.1	83.2	-	-	4.9	71.4
On-stream analysis (XRF)	14.9	8.0	73.3	-	-	6.1	79.0
On-stream size analysis	11.6	-	65.7	-	-	8.7	79.7
Flow density measurement	60.6	15.4	73.4	12.2	-	8.5	30.9
Inventory measurement	28.0	13.3	95.2	-	-	2.8	69.2

TABLE 4.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Copper and Copper-Zinc Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	54.5	25.0	91.7	8.3	-	4.5	40.9
Aut. conveyor - sequential analog	54.5	8.3	91.7	-	-	-	45.5
- computer control	45.5	40.0	100.0	-	-	-	54.5
Aut. slurry pumping - stop select	40.9	-	88.9	-	-	9.1	50.0
- var. speeds	59.1	30.8	92.3	-	-	-	40.9
Aut. handling equip. - ores	59.1	23.1	61.5	-	7.7	4.5	36.4
- slurries	68.2	20.0	73.3	-	-	4.5	27.3
- concentrates	45.5	10.0	70.0	-	-	9.1	45.5
- reagents	59.1	23.1	61.5	7.7	7.7	9.1	31.8
Computer controlled vehicle & equipment	31.8	42.9	57.1	-	-	9.1	59.1
Comp. based vehicle & equip. maintenance	59.1	38.5	69.2	-	-	-	40.9
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	63.6	-	64.3	7.1	-	-	36.4
- underground	36.4	12.5	62.5	-	-	4.5	59.1
Data communication networks - open pit	18.2	25.0	75.0	25.0	-	4.5	77.3
Underground data communication networks	36.4	-	62.5	-	-	4.5	59.1
In plant data networks linking aut. processes	45.5	30.0	90.0	-	-	18.2	36.4
CONTROL							
Analog controllers	59.1	15.4	61.5	-	-	-	40.9
Programmable logic controllers (PLC)	59.1	46.2	76.9	-	-	-	40.9
On-line statistical process control	18.2	25.0	50.0	-	-	9.1	72.7
Supervisory control & data acquisition	40.9	33.3	77.8	-	-	4.5	54.5
Int. expert systems for process control	13.6	33.3	33.3	33.3	-	31.8	54.5
Aut. environmental monitoring & control	31.8	28.6	85.7	-	-	18.2	50.0
Automated T.V. image analysis	22.7	-	20.0	-	-	4.5	72.7
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	9.1	-	100.0	-	-	-	90.9
On-stream analysis (XRF)	72.7	25.0	68.8	-	-	-	27.3
On-stream size analysis	36.4	12.5	25.0	25.0	-	9.1	54.5
Flow density measurement	68.2	20.0	73.3	6.7	-	4.5	27.3
Inventory measurement	45.5	10.0	40.0	20.0	-	4.5	50.0

TABLE 4.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Copper and Copper-Zinc Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	63.7	43.3	67.8	32.2	-	3.5	32.8
Aut. conveyor - sequential analog	56.5	5.0	96.7	-	-	-	43.5
- computer control	62.6	50.1	100.0	-	-	-	37.4
Aut. slurry pumping - stop select	37.7	-	92.5	-	-	24.0	38.3
- var. speeds	66.5	51.4	95.8	-	-	-	33.5
Aut. handling equip. - ores	63.1	21.6	54.2	-	8.8	3.5	33.4
- slurries	66.5	20.5	64.9	-	-	3.5	30.0
- concentrates	51.4	8.3	60.1	-	-	6.3	42.3
- reagents	78.8	17.3	62.0	6.0	6.0	6.3	14.9
Computer controlled vehicle & equipment	34.6	59.4	40.6	-	-	6.3	59.1
Comp. based vehicle & equip. maintenance	75.8	37.0	67.0	-	-	-	24.2
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	61.6	-	46.4	17.2	-	-	38.4
- underground	56.8	36.2	63.8	-	-	3.5	39.8
Data communication networks - open pit	14.5	32.5	82.7	17.3	-	10.6	74.9
Underground data communication networks	38.5	-	46.7	-	-	20.5	40.9
In plant data networks linking aut. proc.	60.7	45.7	95.4	-	-	22.4	16.8
CONTROL							
Analog controllers	66.7	9.1	68.2	-	-	-	33.3
Programmable logic controllers (PLC)	67.9	55.8	76.6	-	-	-	32.1
On-line statistical process control	9.3	26.9	52.8	-	-	23.4	67.3
Supervisory control & data acquisition	57.9	47.9	89.8	-	-	2.8	39.3
Int. expert systems for process control	24.4	84.1	1.9	84.1	-	43.4	32.2
Aut. environmental monitoring & control	43.0	51.4	93.4	-	-	13.8	43.2
Automated T.V. image analysis	23.9	-	7.7	-	-	10.6	65.5
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	6.2	-	100.0	-	-	-	93.8
On-stream analysis (XRF)	88.9	27.9	70.9	-	-	-	11.1
On-stream size analysis	43.8	10.7	11.8	34.9	-	23.0	33.1
Flow density measurement	83.3	10.4	72.3	3.0	-	2.8	13.9
Inventory measurement	43.2	4.3	22.2	23.8	-	20.5	36.3

TABLE 5.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Nickel-Copper Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	80.0	50.0	75.0	25.0	-	-	20.0
Aut. conveyor - sequential analog	60.0	-	100.0	-	-	-	40.0
- computer control	60.0	33.3	100.0	-	-	20.0	20.0
Aut. slurry pumping - stop select	60.0	100.0	100.0	-	-	-	40.0
- var. speeds	80.0	50.0	100.0	-	-	-	20.0
Aut. handling equip. - ores	80.0	75.0	75.0	25.0	-	-	20.0
- slurries	80.0	50.0	75.0	25.0	-	-	20.0
- concentrates	80.0	50.0	75.0	25.0	-	-	20.0
- reagents	80.0	50.0	100.0	-	-	-	20.0
Computer controlled vehicle & equipment	40.0	50.0	-	-	50.0	20.0	40.0
Comp. based vehicle & equip. maintenance	40.0	50.0	50.0	-	50.0	-	60.0
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	40.0	-	50.0	-	-	-	60.0
- underground	80.0	50.0	100.0	-	-	-	20.0
Data communication networks - open pit	20.0	-	100.0	-	-	-	80.0
Underground data communication networks	80.0	75.0	75.0	-	25.0	-	20.0
In plant data networks linking aut. processes	80.0	50.0	50.0	-	25.0	-	20.0
CONTROL							
Analog controllers	80.0	50.0	100.0	-	-	-	20.0
Programmable logic controllers (PLC)	80.0	50.0	100.0	-	-	-	20.0
On-line statistical process control	60.0	66.7	100.0	-	-	20.0	20.0
Supervisory control & data acquisition	80.0	50.0	100.0	-	-	-	20.0
Int. expert systems for process control	60.0	66.7	66.7	-	-	20.0	20.0
Aut. environmental monitoring & control	80.0	50.0	75.0	-	25.0	-	20.0
Automated T.V. image analysis	20.0	-	100.0	-	-	-	80.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	20.0	-	100.0	-	-	-	80.0
On-stream analysis (XRF)	80.0	50.0	100.0	-	-	-	20.0
On-stream size analysis	40.0	-	100.0	-	-	20.0	40.0
Flow density measurement	80.0	25.0	75.0	25.0	-	-	20.0
Inventory measurement	60.0	33.3	66.7	33.3	-	20.0	20.0

TABLE 5.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Nickel-Copper Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	99.8	33.8	81.1	18.9	-	-	0.2
Aut. conveyor - sequential analog	75.5	-	100.0	-	-	-	24.5
- computer control	90.4	26.9	100.0	-	-	9.4	0.2
Aut. slurry pumping - stop select	52.6	100.0	100.0	-	-	-	47.4
- var. speeds	99.8	33.8	100.0	-	-	-	0.2
Aut. handling equip. - ores	99.8	52.7	81.1	18.9	-	-	0.2
- slurries	99.8	28.4	81.1	18.9	-	-	0.2
- concentrates	99.8	28.4	81.1	18.9	-	-	0.2
- reagents	99.8	28.4	100.0	-	-	-	0.2
Computer controlled vehicle & equipment	66.1	28.6	-	-	71.4	24.3	9.6
Comp. based vehicle & equip. maintenance	56.6	16.7	16.7	-	83.3	-	43.4
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	66.1	-	71.4	-	-	-	33.9
- underground	90.6	47.7	100.0	-	-	-	9.4
Data communication networks - open pit	47.2	-	100.0	-	-	-	52.8
Underground data communication networks	90.6	99.8	47.9	-	52.1	-	9.4
In plant data networks linking aut. proc.	99.8	28.4	33.8	-	47.3	-	0.2
CONTROL							
Analog controllers	99.8	33.8	100.0	-	-	-	0.2
Programmable logic controllers (PLC)	99.8	28.4	100.0	-	-	-	0.2
On-line statistical process control	75.5	37.5	100.0	-	-	24.3	0.2
Supervisory control & data acquisition	99.8	28.4	100.0	-	-	-	0.2
Int. expert systems for process control	75.5	37.5	75.0	-	-	24.3	0.2
Aut. environmental monitoring & control	99.8	33.8	81.1	-	18.9	-	0.2
Automated T.V. image analysis	47.2	-	100.0	-	-	-	52.8
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	47.2	-	100.0	-	-	-	52.8
On-stream analysis (XRF)	99.8	28.4	100.0	-	-	-	0.2
On-stream size analysis	71.5	-	100.0	-	-	18.9	9.6
Flow density measurement	99.8	9.5	81.1	18.9	-	-	0.2
Inventory measurement	75.5	12.5	75.0	25.0	-	24.3	0.2

TABLE 6.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Silver-Lead-Zinc Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	43.8	28.6	71.4	28.6	-	12.5	43.8
Aut. conveyor - sequential analog	31.3	40.0	80.0	20.0	-	6.3	62.5
- computer control	25.0	50.0	75.0	25.0	-	12.5	62.5
Aut. slurry pumping - stop select	37.5	16.7	83.3	16.7	-	6.3	56.3
- var. speeds	37.5	33.3	83.3	16.7	-	6.3	56.3
Aut. handling equip. - ores	25.0	-	75.0	-	-	25.0	50.0
- slurries	37.5	33.3	66.7	33.3	-	6.3	56.3
- concentrates	37.5	16.7	66.7	16.7	-	6.3	56.3
- reagents	25.0	100.0	50.0	25.0	-	25.0	50.0
Computer controlled vehicle & equipment	6.3	-	-	-	-	12.5	81.3
Comp. based vehicle & equip. maintenance	31.3	40.0	60.0	40.0	-	18.8	50.0
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	18.8	-	66.7	-	-	-	81.3
- underground	18.8	-	66.7	-	-	6.3	75.0
Data communication networks - open pit	6.3	-	100.0	-	-	-	93.8
Underground data communication networks	18.8	33.3	100.0	-	-	-	81.3
In plant data networks linking aut. processes	18.8	66.7	66.7	-	33.3	12.5	68.8
CONTROL							
Analog controllers	50.0	12.5	87.5	-	12.5	6.3	43.8
Programmable logic controllers (PLC)	50.0	25.0	87.5	-	12.5	12.5	37.5
On-line statistical process control	25.0	50.0	75.0	-	25.0	18.8	56.3
Supervisory control & data acquisition	43.8	57.1	85.7	-	-	6.3	50.0
Int. expert systems for process control	18.8	66.7	66.7	-	33.3	12.5	68.8
Aut. environmental monitoring & control	43.8	28.6	57.1	-	14.3	-	56.3
Automated T.V. image analysis	-	-	-	-	-	6.3	93.8
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	6.3	-	100.0	-	-	-	93.8
On-stream analysis (XRF)	56.3	44.4	88.9	-	-	6.3	37.5
On-stream size analysis	18.8	-	66.7	33.3	-	-	81.3
Flow density measurement	50.0	37.5	75.0	-	12.5	6.3	43.8
Inventory measurement	25.0	50.0	75.0	-	25.0	6.3	68.8

TABLE 6.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Silver-Lead-Zinc Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	80.0	51.3	48.7	51.3	-	8.3	11.7
Aut. conveyor - sequential analog	75.3	54.5	90.9	9.1	-	5.7	19.0
- computer control	45.7	89.9	85.0	15.0	-	17.1	37.2
Aut. slurry pumping - stop select	44.9	15.2	84.8	15.2	-	1.0	54.1
- var. speeds	67.7	60.6	89.9	10.1	-	11.4	20.9
Aut. handling equip. - ores	27.5	-	29.5	-	-	58.2	14.3
- slurries	77.9	33.7	86.8	13.2	-	1.2	20.9
- concentrates	44.9	15.2	41.6	15.2	-	34.2	20.9
- reagents	63.9	100.0	83.9	10.7	-	18.7	17.4
Computer controlled vehicle & equipment	11.4	-	-	-	-	9.1	79.5
Comp. based vehicle & equip. maintenance	57.1	71.8	81.9	18.1	-	27.7	15.1
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	18.3	-	37.7	-	-	-	81.7
- underground	37.6	-	69.7	-	-	1.2	61.2
Data communication networks - open pit	5.7	-	100.0	-	-	-	94.3
Underground data communication networks	60.4	56.6	100.0	-	-	-	39.6
In plant data networks linking aut. proc.	46.8	87.8	85.4	-	14.6	30.8	22.5
CONTROL							
Analog controllers	85.9	8.0	92.0	-	8.0	1.2	12.9
Programmable logic controllers (PLC)	62.1	66.2	89.0	-	11.0	30.8	7.2
On-line statistical process control	35.3	74.2	80.6	-	19.4	40.3	24.3
Supervisory control & data acquisition	83.6	85.9	96.9	-	-	1.2	15.2
Int. expert systems for process control	46.8	87.8	85.4	-	14.6	6.1	47.1
Aut. environmental monitoring & control	82.2	49.9	76.3	-	8.3	-	17.8
Automated T.V. image analysis	-	-	-	-	-	5.7	94.3
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	6.8	-	100.0	-	-	-	93.2
On-stream analysis (XRF)	88.3	45.6	96.0	-	-	4.6	7.2
On-stream size analysis	43.4	-	21.2	78.8	-	-	56.6
Flow density measurement	89.0	58.9	87.2	-	7.7	1.2	9.8
Inventory measurement	48.0	85.6	85.7	-	14.3	1.2	50.8

TABLE 7.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Uranium Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	66.7	16.7	33.3	33.3	16.7	-	33.3
Aut. conveyor - sequential analog	44.4	25.0	100.0	-	-	-	55.6
- computer control	11.1	-	100.0	-	-	-	88.9
Aut. slurry pumping - stop select	77.8	28.6	100.0	-	-	-	22.2
- var. speeds	44.4	25.0	100.0	-	-	11.1	44.4
Aut. handling equip. - ores	44.4	25.0	75.0	-	25.0	-	55.6
- slurries	55.6	40.0	80.0	-	20.0	-	44.4
- concentrates	22.2	50.0	100.0	-	-	-	77.8
- reagents	55.6	40.0	100.0	-	-	-	44.4
Computer controlled vehicle & equipment	22.2	50.0	50.0	50.0	-	11.1	66.7
Comp. based vehicle & equip. maintenance	44.4	-	75.0	25.0	-	11.1	44.4
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	22.2	-	50.0	50.0	-	-	77.8
- underground	33.3	33.3	66.7	33.3	-	11.1	55.6
Data communication networks - open pit	-	-	-	-	-	-	100.0
Underground data communication networks	33.3	66.7	66.7	-	-	-	66.7
In plant data networks linking aut. processes	66.7	16.7	83.3	16.7	-	-	33.3
CONTROL							
Analog controllers	55.6	-	80.0	20.0	-	-	44.4
Programmable logic controllers (PLC)	55.6	40.0	80.0	-	-	11.1	33.3
On-line statistical process control	22.2	-	100.0	-	-	-	77.8
Supervisory control & data acquisition	33.3	33.3	66.7	33.3	-	11.1	55.6
Int. expert systems for process control	44.4	25.0	100.0	-	-	-	55.6
Aut. environmental monitoring & control	55.6	20.0	60.0	20.0	20.0	11.1	33.3
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	22.2	-	100.0	-	-	-	77.8
On-stream analysis (XRF)	33.3	33.3	100.0	-	-	-	66.7
On-stream size analysis	22.2	50.0	50.0	-	50.0	-	77.8
Flow density measurement	55.6	20.0	100.0	-	-	11.1	33.3
Inventory measurement	44.4	25.0	100.0	-	-	-	55.6

TABLE 7.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Uranium Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	86.0	44.8	35.0	47.8	12.2	-	14.0
Aut. conveyor - sequential analog	72.7	52.9	100.0	-	-	-	27.3
- computer control	9.0	-	100.0	-	-	-	91.0
Aut. slurry pumping - stop select	86.9	45.3	100.0	-	-	-	13.1
- var. speeds	71.2	54.0	100.0	-	-	0.9	27.9
Aut. handling equip. - ores	74.9	51.4	48.6	-	51.4	-	25.1
- slurries	72.1	54.6	46.6	-	53.4	-	27.9
- concentrates	41.1	93.6	100.0	-	-	-	58.9
- reagents	75.7	51.9	100.0	-	-	-	24.3
Computer controlled vehicle & equipment	47.5	81.1	81.1	18.9	-	0.9	51.7
Comp. based vehicle & equip. maintenance	45.4	-	53.4	46.6	-	0.9	53.8
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	6.9	-	38.1	61.9	-	-	93.1
- underground	34.3	30.6	92.3	7.7	-	0.9	64.9
Data communication networks - open pit	-	-	-	-	-	-	100.0
Underground data communication networks	49.8	79.0	98.3	-	-	-	50.2
In plant data networks linking aut. proc.	89.6	42.9	85.9	14.1	-	-	10.4
CONTROL							
Analog controllers	85.4	-	85.2	14.8	-	-	14.6
Programmable logic controllers (PLC)	61.4	64.0	98.6	-	-	12.6	26.0
On-line statistical process control	23.8	-	100.0	-	-	-	76.2
Supervisory control & data acquisition	70.1	54.9	69.8	30.2	-	12.6	17.3
Int. expert systems for process control	35.1	2.4	100.0	-	-	-	64.9
Aut. environmental monitoring & control	85.4	45.1	51.8	45.1	3.1	0.9	13.8
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	31.6	-	100.0	-	-	-	68.4
On-stream analysis (XRF)	32.5	2.6	100.0	-	-	-	67.5
On-stream size analysis	3.5	24.5	24.5	-	75.5	-	96.5
Flow density measurement	81.7	47.1	100.0	-	-	12.6	5.7
Inventory measurement	72.7	52.9	100.0	-	-	-	27.3

TABLE 8.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Iron Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	100.0	37.5	62.5	25.0	12.5	-	-
Aut. conveyor - sequential analog	62.5	20.0	100.0	-	-	-	37.5
- computer control	75.0	66.7	83.3	-	16.7	-	25.0
Aut. slurry pumping - stop select	75.0	16.7	83.3	-	16.7	-	25.0
- var. speeds	75.0	33.3	100.0	-	-	-	25.0
Aut. handling equip. - ores	75.0	50.0	100.0	-	-	-	25.0
- slurries	62.5	40.0	80.0	20.0	-	-	37.5
- concentrates	50.0	50.0	100.0	-	-	-	50.0
- reagents	37.5	33.3	100.0	-	-	12.5	50.0
Computer controlled vehicle & equipment	37.5	66.7	100.0	-	-	-	62.5
Comp. based vehicle & equip. maintenance	37.5	100.0	100.0	-	-	25.0	37.5
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	62.5	20.0	80.0	20.0	-	-	37.5
- underground	-	-	-	-	-	-	100.0
Data communication networks - open pit	50.0	50.0	100.0	-	-	-	50.0
Underground data communication networks	-	-	-	-	-	-	100.0
In plant data networks linking aut. processes	62.5	60.0	80.0	-	20.0	25.0	12.5
CONTROL							
Analog controllers	87.5	57.1	85.7	-	14.3	-	12.5
Programmable logic controllers (PLC)	87.5	71.4	71.4	-	28.6	12.5	-
On-line statistical process control	37.5	66.7	100.0	-	-	50.0	12.5
Supervisory control & data acquisition	50.0	100.0	100.0	-	-	12.5	37.5
Int. expert systems for process control	37.5	100.0	100.0	-	-	12.5	50.0
Aut. environmental monitoring & control	37.5	66.7	66.7	33.3	-	12.5	50.0
Automated T.V. image analysis	37.5	66.7	100.0	-	-	-	62.5
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	62.5	60.0	100.0	-	-	12.5	25.0
On-stream analysis (XRF)	37.5	33.3	100.0	-	-	25.0	37.5
On-stream size analysis	12.5	-	100.0	-	-	25.0	62.5
Flow density measurement	100.0	37.5	100.0	-	-	-	-
Inventory measurement	25.0	100.0	50.0	-	50.0	12.5	62.5

TABLE 8.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Iron Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	100.0	24.1	43.9	45.6	10.5	-	-
Aut. conveyor - sequential analog	74.0	9.2	100.0	-	-	-	26.0
- computer control	56.8	57.7	84.6	-	15.4	-	43.2
Aut. slurry pumping - stop select	56.3	12.1	81.4	-	18.6	-	43.7
- var. speeds	84.5	51.7	100.0	-	-	-	15.5
Aut. handling equip. - ores	85.0	28.3	100.0	-	-	-	15.0
- slurries	78.2	22.1	52.9	47.1	-	-	21.8
- concentrates	41.3	41.8	100.0	-	-	-	58.7
- reagents	30.8	22.0	100.0	-	-	8.7	60.4
Computer controlled vehicle & equipment	61.1	39.7	100.0	-	-	-	38.9
Comp. based vehicle & equip. maintenance	34.7	100.0	100.0	-	-	45.6	19.7
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	77.7	22.5	77.5	22.5	-	-	22.3
- underground	-	-	-	-	-	-	100.0
Data communication networks - open pit	71.1	39.3	100.0	-	-	-	28.9
Underground data communication networks	-	-	-	-	-	-	100.0
In plant data networks linking aut. proc.	49.7	52.3	78.9	-	21.1	43.7	6.6
CONTROL							
Analog controllers	63.1	65.8	83.4	-	16.6	-	36.9
Programmable logic controllers (PLC)	82.5	84.4	76.7	-	23.3	17.5	-
On-line statistical process control	50.3	86.9	100.0	-	-	43.5	6.3
Supervisory control & data acquisition	43.5	100.0	100.0	-	-	6.8	49.7
Int. expert systems for process control	54.1	100.0	100.0	-	-	17.5	28.4
Aut. environmental monitoring & control	33.0	73.5	73.5	26.5	-	36.9	30.2
Automated T.V. image analysis	34.7	69.8	100.0	-	-	-	65.3
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	78.4	44.3	100.0	-	-	8.7	12.9
On-stream analysis (XRF)	19.7	34.5	100.0	-	-	27.9	52.4
On-stream size analysis	36.9	-	100.0	-	-	24.3	38.9
Flow density measurement	100.0	34.7	100.0	-	-	-	-
Inventory measurement	17.3	100.0	39.3	-	60.7	17.5	65.3

TABLE 9.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Other Metal Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	25.0	50.0	50.0	50.0	-	-	75.0
Aut. conveyor - sequential analog	25.0	-	100.0	-	-	-	75.0
- computer control	-	-	-	-	-	12.5	87.5
Aut. slurry pumping - stop select	12.5	-	100.0	-	-	-	87.5
- var. speeds	12.5	-	100.0	-	-	12.5	75.0
Aut. handling equip. - ores	12.5	-	100.0	-	-	-	87.5
- slurries	12.5	-	100.0	-	-	-	87.5
- concentrates	-	-	-	-	-	12.5	87.5
- reagents	12.5	-	100.0	-	-	-	87.5
Computer controlled vehicle & equipment	-	-	-	-	-	-	100.0
Comp. based vehicle & equip. maintenance	12.5	-	100.0	-	-	-	87.5
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	25.0	-	100.0	-	-	-	75.0
- underground	-	-	-	-	-	25.0	75.0
Data communication networks - open pit	-	-	-	-	-	-	100.0
Underground data communication networks	12.5	-	-	-	-	-	87.5
In plant data networks linking aut. processes	12.5	-	100.0	-	-	12.5	75.0
CONTROL							
Analog controllers	25.0	-	100.0	-	-	-	75.0
Programmable logic controllers (PLC)	37.5	33.3	100.0	-	-	-	62.5
On-line statistical process control	-	-	-	-	-	12.5	87.5
Supervisory control & data acquisition	12.5	-	100.0	-	-	-	87.5
Int. expert systems for process control	-	-	-	-	-	12.5	87.5
Aut. environmental monitoring & control	12.5	-	100.0	-	-	12.5	75.0
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	37.5	66.7	100.0	-	-	-	62.5
On-stream size analysis	-	-	-	-	-	-	100.0
Flow density measurement	25.0	100.0	100.0	-	-	12.5	62.5
Inventory measurement	12.5	-	100.0	-	-	-	87.5

TABLE 9.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Other Metal Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	35.5	30.9	30.9	69.1	-	-	64.5
Aut. conveyor - sequential analog	35.5	-	100.0	-	-	-	64.5
- computer control	-	-	-	-	-	24.5	75.5
Aut. slurry pumping - stop select	24.5	-	100.0	-	-	-	75.5
- var. speeds	24.5	-	100.0	-	-	11.0	64.5
Aut. handling equip. - ores	24.5	-	100.0	-	-	-	75.5
- slurries	24.5	-	100.0	-	-	-	75.5
- concentrates	-	-	-	-	-	24.5	75.5
- reagents	24.5	-	100.0	-	-	-	75.5
Computer controlled vehicle & equipment	-	-	-	-	-	-	100.0
Comp. based vehicle & equip. maintenance	24.5	-	100.0	-	-	-	75.5
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	59.2	-	100.0	-	-	-	40.8
- underground	-	-	-	-	-	28.0	72.0
Data communication networks - open pit	-	-	-	-	-	-	100.0
Underground data communication networks	17.1	-	-	-	-	-	82.9
In plant data networks linking aut. proc.	24.5	-	100.0	-	-	11.0	64.5
CONTROL							
Analog controllers	35.5	-	100.0	-	-	-	64.5
Programmable logic controllers (PLC)	70.1	15.6	100.0	-	-	-	29.9
On-line statistical process control	-	-	-	-	-	11.0	89.0
Supervisory control & data acquisition	24.5	-	100.0	-	-	-	75.5
Int. expert systems for process control	-	-	-	-	-	24.5	75.5
Aut. environmental monitoring & control	24.5	-	100.0	-	-	11.0	64.5
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	76.2	54.5	100.0	-	-	-	23.8
On-stream size analysis	-	-	-	-	-	-	100.0
Flow density measurement	35.5	100.0	100.0	-	-	17.1	47.5
Inventory measurement	11.0	-	100.0	-	-	-	89.0

TABLE 10.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Asbestos Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	75.0	-	100.0	-	-	-	25.0
Aut. conveyor - sequential analog	50.0	50.0	100.0	-	-	-	50.0
- computer control	50.0	50.0	100.0	-	-	-	50.0
Aut. slurry pumping - stop select	25.0	-	100.0	-	-	25.0	50.0
- var. speeds	-	-	-	-	-	25.0	75.0
Aut. handling equip. - ores	75.0	-	100.0	-	-	-	25.0
- slurries	-	-	-	-	-	25.0	75.0
- concentrates	50.0	50.0	100.0	-	-	-	50.0
- reagents	-	-	-	-	-	-	100.0
Computer controlled vehicle & equipment	50.0	-	100.0	-	-	25.0	25.0
Comp. based vehicle & equip. maintenance	-	-	-	-	-	25.0	75.0
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	100.0	-	75.0	-	-	-	-
- underground	25.0	-	100.0	-	-	-	75.0
Data communication networks - open pit	25.0	-	100.0	-	-	-	75.0
Underground data communication networks	-	-	-	-	-	-	100.0
In plant data networks linking aut. processes	25.0	-	100.0	-	-	-	75.0
CONTROL							
Analog controllers	75.0	-	66.7	33.3	-	-	25.0
Programmable logic controllers (PLC)	75.0	66.7	66.7	-	-	25.0	-
On-line statistical process control	-	-	-	-	-	50.0	50.0
Supervisory control & data acquisition	25.0	-	100.0	-	-	-	75.0
Int. expert systems for process control	50.0	-	100.0	-	-	-	50.0
Aut. environmental monitoring & control	75.0	-	100.0	-	-	-	25.0
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	25.0	-	100.0	-	-	-	75.0
On-stream size analysis	-	-	-	-	-	25.0	75.0
Flow density measurement	50.0	-	100.0	-	-	25.0	25.0
Inventory measurement	25.0	-	-	100.0	-	-	75.0

TABLE 10.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Asbestos Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	87.9	-	100.0	-	-	-	12.1
Aut. conveyor - sequential analog	74.1	67.9	100.0	-	-	-	25.9
- computer control	74.1	67.9	100.0	-	-	-	25.9
Aut. slurry pumping - stop select	50.3	-	100.0	-	-	12.1	37.6
- var. speeds	-	-	-	-	-	12.1	87.9
Aut. handling equip. - ores	87.9	-	100.0	-	-	-	12.1
- slurries	-	-	-	-	-	12.1	87.9
- concentrates	74.1	67.9	100.0	-	-	-	25.9
- reagents	-	-	-	-	-	-	100.0
Computer controlled vehicle & equipment	37.6	-	100.0	-	-	12.1	50.3
Comp. based vehicle & equip. maintenance	-	-	-	-	-	12.1	87.9
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	100.0	-	87.9	-	-	-	-
- underground	50.3	-	100.0	-	-	-	49.7
Data communication networks - open pit	50.3	-	100.0	-	-	-	49.7
Underground data communication networks	-	-	-	-	-	-	100.0
In plant data networks linking aut. proc.	23.8	-	100.0	-	-	-	76.2
CONTROL							
Analog controllers	87.9	-	84.3	15.7	-	-	12.1
Programmable logic controllers (PLC)	87.9	72.9	84.3	-	-	12.1	-
On-line statistical process control	-	-	-	-	-	74.1	25.9
Supervisory control & data acquisition	23.8	-	100.0	-	-	-	76.2
Int. expert systems for process control	74.1	-	100.0	-	-	-	25.9
Aut. environmental monitoring & control	87.9	-	100.0	-	-	-	12.1
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	23.8	-	100.0	-	-	-	76.2
On-stream size analysis	-	-	-	-	-	12.1	87.9
Flow density measurement	37.6	-	100.0	-	-	12.1	50.3
Inventory measurement	23.8	-	-	100.0	-	-	76.2

TABLE 11.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Gypsum Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	33.3	40.0	80.0	20.0	-	6.7	60.0
Aut. conveyor - sequential analog	26.7	25.0	75.0	-	-	6.7	66.7
- computer control	13.3	-	100.0	-	-	33.3	53.3
Aut. slurry pumping - stop select	6.7	-	100.0	-	-	6.7	86.7
- var. speeds	6.7	-	100.0	-	-	6.7	86.7
Aut. handling equip. - ores	-	-	-	-	-	20.0	80.0
- slurries	-	-	-	-	-	6.7	93.3
- concentrates	-	-	-	-	-	6.7	93.3
- reagents	-	-	-	-	-	6.7	93.3
Computer controlled vehicle & equipment	-	-	-	-	-	26.7	73.3
Comp. based vehicle & equip. maintenance	6.7	-	100.0	-	-	33.3	60.0
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	46.7	28.6	57.1	14.3	14.3	13.3	40.0
- underground	-	-	-	-	-	13.3	86.7
Data communication networks - open pit	6.7	-	-	-	-	20.0	73.3
Underground data communication networks	-	-	-	-	-	20.0	80.0
In plant data networks linking aut. processes	-	-	-	-	-	20.0	80.0
CONTROL							
Analog controllers	20.0	33.3	100.0	-	-	13.3	66.7
Programmable logic controllers (PLC)	33.3	20.0	60.0	-	20.0	26.7	40.0
On-line statistical process control	-	-	-	-	-	26.7	73.3
Supervisory control & data acquisition	-	-	-	-	-	20.0	80.0
Int. expert systems for process control	-	-	-	-	-	26.7	73.3
Aut. environmental monitoring & control	-	-	-	-	-	13.3	86.7
Automated T.V. image analysis	-	-	-	-	-	13.3	86.7
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	13.3	50.0	100.0	-	-	6.7	80.0
On-stream analysis (XRF)	-	-	-	-	-	6.7	93.3
On-stream size analysis	-	-	-	-	-	6.7	93.3
Flow density measurement	6.7	-	-	-	-	6.7	86.7
Inventory measurement	20.0	-	66.7	-	-	26.7	53.3

TABLE 11.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Gypsum Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	26.6	35.6	91.1	8.9	-	3.1	70.3
Aut. conveyor - sequential analog	21.3	26.7	82.2	-	-	3.1	75.7
- computer control	14.2	-	100.0	-	-	32.4	53.4
Aut. slurry pumping - stop select	11.8	-	100.0	-	-	3.1	85.1
- var. speeds	11.8	-	100.0	-	-	3.1	85.1
Aut. handling equip. - ores	-	-	-	-	-	17.6	82.4
- slurries	-	-	-	-	-	3.1	96.9
- concentrates	-	-	-	-	-	3.1	96.9
- reagents	-	-	-	-	-	3.1	96.9
Computer controlled vehicle & equipment	-	-	-	-	-	29.4	70.6
Comp. based vehicle & equip. maintenance	2.4	-	100.0	-	-	32.4	65.2
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	64.8	27.0	50.7	18.2	18.2	7.2	28.0
- underground	-	-	-	-	-	11.9	88.1
Data communication networks - open pit	8.3	-	-	-	-	20.6	71.2
Underground data communication networks	-	-	-	-	-	14.3	85.7
In plant data networks linking aut. proc.	-	-	-	-	-	11.1	88.9
CONTROL							
Analog controllers	26.4	21.5	100.0	-	-	6.9	66.8
Programmable logic controllers (PLC)	37.0	15.3	53.7	-	24.0	21.6	41.4
On-line statistical process control	-	-	-	-	-	15.5	84.5
Supervisory control & data acquisition	-	-	-	-	-	11.1	88.9
Int. expert systems for process control	-	-	-	-	-	15.5	84.5
Aut. environmental monitoring & control	-	-	-	-	-	8.7	91.3
Automated T.V. image analysis	-	-	-	-	-	8.7	91.3
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	8.0	70.6	100.0	-	-	3.1	88.9
On-stream analysis (XRF)	-	-	-	-	-	3.1	96.9
On-stream size analysis	-	-	-	-	-	3.1	96.9
Flow density measurement	8.3	-	-	-	-	3.1	88.7
Inventory measurement	31.9	-	74.1	-	-	30.5	37.6

TABLE 12.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Potash Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	90.9	10.0	80.0	10.0	-	-	9.1
Aut. conveyor - sequential analog	72.7	-	100.0	-	-	-	27.3
- computer control	90.9	20.0	100.0	-	-	9.1	-
Aut. slurry pumping - stop select	72.7	12.5	100.0	-	-	-	27.3
- var. speeds	54.5	-	83.3	16.7	-	9.1	36.4
Aut. handling equip. - ores	63.6	14.3	100.0	-	-	-	36.4
- slurries	54.5	33.3	100.0	-	-	-	45.5
- concentrates	63.6	28.6	85.7	-	-	-	36.4
- reagents	63.6	28.6	85.7	-	-	9.1	27.3
Computer controlled vehicle & equipment	9.1	100.0	-	100.0	-	27.3	63.6
Comp. based vehicle & equip. maintenance	45.5	40.0	80.0	20.0	-	9.1	45.5
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	27.3	-	100.0	-	-	-	72.7
- underground	36.4	-	75.0	25.0	-	9.1	54.5
Data communication networks - open pit	18.2	50.0	100.0	-	-	-	81.8
Underground data communication networks	27.3	66.7	100.0	-	-	18.2	54.5
In plant data networks linking aut. processes	63.6	42.9	100.0	-	-	9.1	27.3
CONTROL							
Analog controllers	81.8	11.1	88.9	-	-	-	18.2
Programmable logic controllers (PLC)	100.0	36.4	100.0	-	-	-	-
On-line statistical process control	54.5	50.0	83.3	-	16.7	18.2	27.3
Supervisory control & data acquisition	72.7	37.5	87.5	12.5	-	9.1	18.2
Int. expert systems for process control	-	-	-	-	-	18.2	81.8
Aut. environmental monitoring & control	45.5	40.0	100.0	-	-	9.1	45.5
Automated T.V. image analysis	27.3	33.3	66.7	33.3	-	-	72.7
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	36.4	25.0	75.0	25.0	-	-	63.6
On-stream analysis (XRF)	45.5	40.0	100.0	-	-	-	54.5
On-stream size analysis	9.1	100.0	100.0	-	-	9.1	81.8
Flow density measurement	81.8	22.2	88.9	-	-	-	18.2
Inventory measurement	45.5	20.0	80.0	20.0	-	9.1	45.5

TABLE 12.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Potash Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	96.8	26.1	83.3	12.4	-	-	3.2
Aut. conveyor - sequential analog	78.9	-	100.0	-	-	-	21.1
- computer control	95.8	36.4	100.0	-	-	4.2	-
Aut. slurry pumping - stop select	71.4	13.4	100.0	-	-	-	28.6
- var. speeds	49.5	-	82.1	17.9	-	4.2	46.3
Aut. handling equip. - ores	76.0	33.2	100.0	-	-	-	24.0
- slurries	72.8	47.9	100.0	-	-	-	27.2
- concentrates	77.0	45.2	94.5	-	-	-	23.0
- reagents	77.0	45.2	94.5	-	-	8.3	14.6
Computer controlled vehicle & equipment	25.3	100.0	-	100.0	-	26.6	48.1
Comp. based vehicle & equip. maintenance	59.7	58.4	86.2	13.8	-	3.2	37.1
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	32.7	-	100.0	-	-	-	67.3
- underground	29.2	-	89.2	10.8	-	9.6	61.2
Data communication networks - open pit	7.4	42.8	100.0	-	-	-	92.6
Underground data communication networks	42.4	80.6	100.0	-	-	18.4	39.2
In plant data networks linking aut. proc.	77.0	50.7	100.0	-	-	3.2	19.8
CONTROL							
Analog controllers	79.8	31.7	96.0	-	-	-	20.2
Programmable logic controllers (PLC)	100.0	46.4	100.0	-	-	-	-
On-line statistical process control	66.9	56.6	93.7	-	6.3	18.5	14.6
Supervisory control & data acquisition	80.2	47.4	89.0	11.0	-	3.2	16.6
Int. expert systems for process control	-	-	-	-	-	34.9	65.1
Aut. environmental monitoring & control	64.6	53.9	100.0	-	-	3.2	32.2
Automated T.V. image analysis	46.1	54.8	45.2	54.8	-	-	53.9
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	52.0	48.5	51.5	48.5	-	-	48.0
On-stream analysis (XRF)	56.8	61.3	100.0	-	-	-	43.2
On-stream size analysis	25.3	100.0	100.0	-	-	9.6	65.1
Flow density measurement	79.7	43.7	96.0	-	-	-	20.3
Inventory measurement	55.6	45.5	92.4	7.6	-	9.6	34.8

TABLE 13.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Salt Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	54.5	16.7	66.7	16.7	-	9.1	36.4
Aut. conveyor - sequential analog	27.3	33.3	33.3	33.3	33.3	-	72.7
- computer control	18.2	50.0	50.0	-	50.0	-	81.8
Aut. slurry pumping - stop select	18.2	-	100.0	-	-	9.1	72.7
- var. speeds	9.1	-	100.0	-	-	9.1	81.8
Aut. handling equip. - ores	18.2	50.0	-	-	50.0	-	81.8
- slurries	-	-	-	-	-	-	100.0
- concentrates	9.1	-	100.0	-	-	-	90.9
- reagents	-	-	-	-	-	-	100.0
Computer controlled vehicle & equipment	9.1	-	-	-	-	18.2	72.7
Comp. based vehicle & equip. maintenance	18.2	50.0	100.0	-	-	27.3	54.5
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	-	-	-	-	-	-	100.0
- underground	9.1	100.0	100.0	-	-	-	90.9
Data communication networks - open pit	-	-	-	-	-	-	100.0
Underground data communication networks	-	-	-	-	-	18.2	81.8
In plant data networks linking aut. processes	27.3	-	66.7	-	-	9.1	63.6
CONTROL							
Analog controllers	54.5	16.7	100.0	-	-	9.1	36.4
Programmable logic controllers (PLC)	90.9	40.0	90.0	-	10.0	-	9.1
On-line statistical process control	-	-	-	-	-	18.2	81.8
Supervisory control & data acquisition	18.2	50.0	100.0	-	-	18.2	63.6
Int. expert systems for process control	-	-	-	-	-	-	100.0
Aut. environmental monitoring & control	27.3	33.3	100.0	-	-	9.1	63.6
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	9.1	100.0	100.0	-	-	-	90.9
On-stream size analysis	-	-	-	-	-	-	100.0
Flow density measurement	27.3	-	100.0	-	-	-	72.7
Inventory measurement	18.2	-	50.0	50.0	-	-	81.8

TABLE 13.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Salt Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	36.6	35.7	39.2	35.7	-	3.5	60.0
Aut. conveyor - sequential analog	24.9	52.5	27.0	20.5	52.5	-	75.1
- computer control	15.1	86.5	13.5	-	86.5	-	84.9
Aut. slurry pumping - stop select	5.5	-	100.0	-	-	9.2	85.3
- var. speeds	3.5	-	100.0	-	-	9.2	87.4
Aut. handling equip. - ores	19.8	66.0	-	-	66.0	-	80.2
- slurries	-	-	-	-	-	-	100.0
- concentrates	13.1	-	100.0	-	-	-	86.9
- reagents	-	-	-	-	-	-	100.0
Computer controlled vehicle & equipment	6.7	-	-	-	-	16.5	76.7
Comp. based vehicle & equip. maintenance	44.3	92.2	100.0	-	-	25.1	30.6
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	-	-	-	-	-	-	100.0
- underground	6.7	100.0	100.0	-	-	-	93.3
Data communication networks - open pit	-	-	-	-	-	-	100.0
Underground data communication networks	-	-	-	-	-	19.8	80.2
In plant data networks linking aut. proc.	49.6	-	86.4	-	-	13.1	37.4
CONTROL							
Analog controllers	71.2	18.3	100.0	-	-	5.1	23.7
Programmable logic controllers (PLC)	97.3	75.7	86.6	-	13.4	-	2.7
On-line statistical process control	-	-	-	-	-	16.5	83.5
Supervisory control & data acquisition	42.8	95.2	100.0	-	-	16.5	40.6
Int. expert systems for process control	-	-	-	-	-	-	100.0
Aut. environmental monitoring & control	56.5	23.1	100.0	-	-	5.1	38.4
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	40.8	100.0	100.0	-	-	-	59.2
On-stream size analysis	-	-	-	-	-	-	100.0
Flow density measurement	45.5	-	100.0	-	-	-	54.5
Inventory measurement	53.9	-	75.8	24.2	-	-	46.1

TABLE 14.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Other Non-Metal Mines (except coal)

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	30.3	40.0	90.0	-	-	6.1	63.6
Aut. conveyor - sequential analog	27.3	33.3	88.9	-	-	-	72.7
- computer control	3.0	100.0	-	-	-	9.1	87.9
Aut. slurry pumping - stop select	6.1	50.0	100.0	-	-	6.1	87.9
- var. speeds	3.0	100.0	100.0	-	-	9.1	87.9
Aut. handling equip. - ores	3.0	100.0	-	100.0	-	3.0	93.9
- slurries	-	-	-	-	-	9.1	90.9
- concentrates	3.0	-	100.0	-	-	9.1	87.9
- reagents	-	-	-	-	-	9.1	90.9
Computer controlled vehicle & equipment	9.1	33.3	100.0	-	-	-	90.9
Comp. based vehicle & equip. maintenance	12.1	75.0	100.0	-	-	9.1	78.8
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	21.2	14.3	85.7	-	-	3.0	75.8
- underground	3.0	-	100.0	-	-	-	97.0
Data communication networks - open pit	3.0	-	-	-	-	-	97.0
Underground data communication networks	3.0	100.0	100.0	-	-	-	97.0
In plant data networks linking aut. processes	6.1	50.0	100.0	-	-	9.1	84.8
CONTROL							
Analog controllers	24.2	12.5	75.0	-	-	6.1	69.7
Programmable logic controllers (PLC)	21.2	42.9	71.4	-	-	12.1	66.7
On-line statistical process control	9.1	-	66.7	-	-	12.1	78.8
Supervisory control & data acquisition	3.0	-	-	-	-	6.1	90.9
Int. expert systems for process control	6.1	100.0	100.0	-	-	3.0	90.9
Aut. environmental monitoring & control	-	-	-	-	-	3.0	97.0
Automated T.V. image analysis	6.1	50.0	100.0	-	-	6.1	87.9
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	3.0	-	100.0	-	-	6.1	90.9
On-stream analysis (XRF)	-	-	-	-	-	6.1	93.9
On-stream size analysis	-	-	-	-	-	6.1	93.9
Flow density measurement	9.1	33.3	100.0	-	-	15.2	75.8
Inventory measurement	6.1	50.0	100.0	-	-	9.1	84.8

TABLE 14.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Other Non-Metal Mines (except coal)

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	36.8	49.2	94.4	-	-	13.2	50.0
Aut. conveyor - sequential analog	31.7	33.7	76.5	-	-	-	68.3
- computer control	7.4	100.0	-	-	-	26.3	66.3
Aut. slurry pumping - stop select	6.7	67.9	100.0	-	-	18.0	75.3
- var. speeds	4.5	100.0	100.0	-	-	19.0	76.4
Aut. handling equip. - ores	7.4	100.0	-	100.0	-	4.5	88.0
- slurries	-	-	-	-	-	22.6	77.4
- concentrates	3.5	-	100.0	-	-	22.6	74.0
- reagents	-	-	-	-	-	22.6	77.4
Computer controlled vehicle & equipment	8.8	24.5	100.0	-	-	-	91.2
Comp. based vehicle & equip. maintenance	21.7	86.6	100.0	-	-	13.5	64.9
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	26.8	52.5	98.5	-	-	12.8	60.4
- underground	4.5	-	100.0	-	-	-	95.5
Data communication networks - open pit	0.4	-	-	-	-	-	99.6
Underground data communication networks	9.5	100.0	100.0	-	-	-	90.5
In plant data networks linking aut. proc.	8.5	46.6	100.0	-	-	17.1	74.4
CONTROL							
Analog controllers	29.8	13.3	68.1	-	-	15.0	55.3
Programmable logic controllers (PLC)	31.9	42.5	70.2	-	-	31.5	36.6
On-line statistical process control	9.5	-	78.3	-	-	19.8	70.7
Supervisory control & data acquisition	7.4	-	-	-	-	5.0	87.6
Int. expert systems for process control	6.1	100.0	100.0	-	-	7.4	86.4
Aut. environmental monitoring & control	-	-	-	-	-	14.0	86.0
Automated T.V. image analysis	6.7	32.1	100.0	-	-	5.0	88.3
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	4.5	-	100.0	-	-	4.5	91.0
On-stream analysis (XRF)	-	-	-	-	-	17.5	82.5
On-stream size analysis	-	-	-	-	-	17.5	82.5
Flow density measurement	9.2	23.4	100.0	-	-	30.2	60.7
Inventory measurement	9.8	40.7	100.0	-	-	6.9	83.4

TABLE 15.1 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY MINES)

Coal Mines

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	47.4	22.2	66.7	22.2	-	-	52.6
Aut. conveyor - sequential analog	31.6	-	66.7	-	-	-	68.4
- computer control	21.1	-	100.0	-	-	15.8	63.2
Aut. slurry pumping - stop select	36.8	14.3	85.7	14.3	-	5.3	57.9
- var. speeds	26.3	-	60.0	40.0	-	21.1	52.6
Aut. handling equip. - ores	10.5	-	100.0	-	-	10.5	78.9
- slurries	21.1	-	75.0	-	-	26.3	52.6
- concentrates	5.3	-	100.0	-	-	10.5	84.2
- reagents	-	-	-	-	-	26.3	73.7
Computer controlled vehicle & equipment	15.8	-	100.0	-	-	-	84.2
Comp. based vehicle & equip. maintenance	42.1	12.5	62.5	25.0	-	5.3	52.6
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	68.4	-	76.9	-	-	-	31.6
- underground	10.5	-	100.0	-	-	10.5	78.9
Data communication networks - open pit	26.3	20.0	80.0	-	20.0	15.8	57.9
Underground data communication networks	-	-	-	-	-	10.5	89.5
In plant data networks linking aut. processes	15.8	33.3	100.0	-	-	21.1	63.2
CONTROL							
Analog controllers	47.4	22.2	88.9	-	-	-	52.6
Programmable logic controllers (PLC)	57.9	45.5	72.7	-	27.3	5.3	36.8
On-line statistical process control	10.5	50.0	50.0	-	50.0	36.8	52.6
Supervisory control & data acquisition	5.3	-	100.0	-	-	31.6	63.2
Int. expert systems for process control	5.3	-	-	-	-	15.8	78.9
Aut. environmental monitoring & control	26.3	-	60.0	-	-	10.5	63.2
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	10.5	89.5
On-stream analysis (XRF)	5.3	100.0	100.0	-	-	21.1	73.7
On-stream size analysis	-	-	-	-	-	5.3	94.7
Flow density measurement	31.6	16.7	83.3	-	-	15.8	52.6
Inventory measurement	15.8	-	66.7	-	-	-	84.2

TABLE 15.2 THE USE OF TECHNOLOGY BY INDUSTRY (WEIGHTED BY EMPLOYEES)

Coal Mines

Technologies	YES					NO	
	Curre-ntly use	Plan to in-crease usage	Expect ations met	Expect ations not met	Expect ations excee-ded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	86.9	24.7	64.5	27.5	-	-	13.1
Aut. conveyor - sequential analog	55.8	-	64.5	-	-	-	44.2
- computer control	36.6	-	100.0	-	-	27.9	35.5
Aut. slurry pumping - stop select	74.5	22.5	97.0	3.0	-	0.6	24.9
- var. speeds	37.4	-	51.9	48.1	-	26.2	36.4
Aut. handling equip. - ores	28.1	-	100.0	-	-	7.6	64.3
- slurries	37.4	-	94.1	-	-	33.2	29.4
- concentrates	22.8	-	100.0	-	-	7.6	69.6
- reagents	-	-	-	-	-	51.9	48.1
Computer controlled vehicle & equipment	30.3	-	100.0	-	-	-	69.7
Comp. based vehicle & equip. maintenance	53.2	1.3	89.5	4.7	-	6.1	40.7
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	88.0	-	87.7	-	-	-	12.0
- underground	7.7	-	100.0	-	-	4.8	87.5
Data communication networks - open pit	55.9	29.9	87.2	-	12.8	22.5	21.7
Underground data communication networks	-	-	-	-	-	4.8	95.2
In plant data networks linking aut. proc.	29.5	17.8	100.0	-	-	32.6	37.9
CONTROL							
Analog controllers	59.3	20.0	99.0	-	-	-	40.7
Programmable logic controllers (PLC)	89.8	65.6	90.1	-	9.9	4.2	6.0
On-line statistical process control	9.4	76.4	76.4	-	23.6	71.8	18.8
Supervisory control & data acquisition	0.7	-	100.0	-	-	49.0	50.3
Int. expert systems for process control	0.6	-	-	-	-	28.4	70.9
Aut. environmental monitoring & control	39.6	-	90.7	-	-	8.9	51.5
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	10.0	90.0
On-stream analysis (XRF)	16.7	100.0	100.0	-	-	47.5	35.8
On-stream size analysis	-	-	-	-	-	4.2	95.8
Flow density measurement	57.8	8.2	91.8	-	-	21.5	20.7
Inventory measurement	10.5	-	70.8	-	-	-	89.5

TABLE 16.1 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY MINES)

Technologies	Currently use										
	%										
	Nfld.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Yukon	N.T.
AUTOMATED MATERIAL HANDLING											
Automatic bin level measurement	30.0	21.4	37.5	32.8	69.8	25.0	56.0	37.5	53.8	x	62.5
Aut. conveyor - sequential analog	10.0	7.1	50.0	36.2	45.3	37.5	36.0	25.0	35.9	x	37.5
- computer control	10.0	7.1	37.5	19.0	37.7	12.5	44.0	-	33.3	x	25.0
Aut. slurry pumping - stop select	20.0	7.1	25.0	15.5	39.6	12.5	48.0	37.5	48.7	x	62.5
- var. speeds	30.0	14.3	50.0	13.8	41.5	12.5	24.0	25.0	43.6	x	62.5
Aut. handling equip. - ores	20.0	7.1	25.0	15.5	45.3	37.5	28.0	-	35.9	x	25.0
- slurries	20.0	7.1	50.0	10.3	35.8	37.5	32.0	12.5	38.5	x	37.5
- concentrates	10.0	-	37.5	19.0	24.5	37.5	28.0	-	23.1	x	25.0
- reagents	-	7.1	37.5	15.5	34.0	37.5	32.0	-	25.6	x	25.0
Computer controlled vehicle & equipment	10.0	-	-	13.8	15.1	37.5	16.0	12.5	12.8	x	-
Comp. based vehicle & equip. maintenance	20.0	14.3	25.0	19.0	35.8	25.0	44.0	37.5	30.8	x	37.5
COMMUNICATIONS & NETWORKS											
Radio based voice networks - open pit	30.0	42.9	25.0	17.2	22.6	50.0	32.0	50.0	66.7	x	37.5
- underground	-	7.1	12.5	13.8	28.3	37.5	20.0	12.5	7.7	x	25.0
Data communication networks - open pit	20.0	7.1	12.5	6.9	5.7	-	8.0	25.0	17.9	x	-
Underground data communication networks	10.0	-	25.0	17.2	24.5	37.5	16.0	-	5.1	x	25.0
In plant data networks linking aut. processes	10.0	7.1	50.0	15.5	45.3	12.5	36.0	12.5	23.1	x	25.0
CONTROL											
Analog controllers	20.0	21.4	37.5	27.6	62.3	37.5	52.0	50.0	56.4	x	75.0
Programmable logic controllers (PLC)	30.0	28.6	62.5	36.2	69.8	25.0	60.0	62.5	56.4	x	75.0
On-line statistical process control	10.0	-	25.0	6.9	24.5	12.5	28.0	12.5	12.8	x	25.0
Supervisory control & data acquisition	10.0	7.1	62.5	17.2	32.1	12.5	28.0	25.0	15.4	x	12.5
Int. expert systems for process control	20.0	-	25.0	10.3	20.8	12.5	8.0	-	5.1	x	-
Aut. environmental monitoring & control	-	7.1	62.5	13.8	39.6	12.5	16.0	50.0	30.8	x	25.0
Automated T.V. image analysis	10.0	-	12.5	10.3	9.4	25.0	12.0	-	2.6	x	12.5
AUTOMATED PROCESSING SYSTEMS											
Near-stream analysis	20.0	-	-	17.2	18.9	-	16.0	-	5.1	x	-
On-stream analysis (XRF)	-	7.1	50.0	20.7	26.4	37.5	24.0	12.5	25.6	x	-
On-stream size analysis	10.0	-	25.0	3.4	13.2	25.0	16.0	-	7.7	x	-
Flow density measurement	30.0	14.3	37.5	22.4	54.7	62.5	52.0	50.0	48.7	x	75.0
Inventory measurement	10.0	14.3	37.5	17.2	34.0	50.0	28.0	25.0	15.4	x	25.0

TABLE 16.2 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY EMPLOYEES)

Technologies	Currently use										
	%										
	Nfld.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Yukon	N.T.
AUTOMATED MATERIAL HANDLING											
Automatic bin level measurement	80.2	40.7	77.0	59.5	90.0	56.1	74.2	43.4	85.9	x	67.0
Aut. conveyor - sequential analog	56.2	17.2	83.6	54.8	65.3	56.5	47.5	40.3	58.9	x	53.9
- computer control	16.0	7.2	77.0	52.0	64.8	53.2	66.6	-	52.7	x	45.9
Aut. slurry pumping - stop select	24.0	17.2	15.5	42.4	48.1	53.2	62.0	31.4	84.1	x	81.7
- var. speeds	80.2	23.3	80.8	24.6	77.5	53.2	31.6	28.3	63.8	x	75.1
Aut. handling equip. - ores	72.1	17.2	27.4	42.8	71.6	95.8	58.6	-	62.8	x	45.9
- slurries	72.1	17.2	80.8	21.0	65.8	95.8	65.0	6.8	66.4	x	68.6
- concentrates	16.0	-	31.2	44.9	54.4	95.8	59.4	-	45.9	x	25.7
- reagents	-	17.2	77.0	27.1	74.3	95.8	60.2	-	39.2	x	40.8
Computer controlled vehicle & equip.	56.2	-	-	24.9	34.5	95.8	42.4	6.8	31.8	x	-
Comp. based vehicle & equip. maintenance	24.0	23.3	56.3	28.5	59.4	42.6	73.8	55.7	54.5	x	56.0
COMMUNICATIONS & NETWORKS											
Radio based voice networks - open pit	82.5	51.4	14.9	43.9	33.5	96.2	48.8	43.3	81.0	x	24.6
- underground	-	3.5	11.7	30.1	59.6	95.8	32.6	21.5	14.0	x	50.5
Data communication networks - open pit	72.1	5.1	8.3	25.0	22.7	-	5.5	28.3	38.1	x	-
Underground data communication networks	3.4	-	61.3	22.6	52.2	95.8	40.9	-	13.0	x	50.5
In plant data networks linking aut. proc.	16.0	17.2	85.2	34.5	81.2	53.2	50.8	46.8	47.6	x	45.9
CONTROL											
Analog controllers	24.0	39.6	65.1	56.0	87.2	56.7	60.0	73.5	81.6	x	87.2
Programmable logic controllers (PLC)	80.2	44.7	89.0	61.0	85.8	56.1	74.5	95.9	84.1	x	87.2
On-line statistical process control	56.2	-	24.0	11.3	38.9	53.2	44.0	6.8	16.2	x	50.5
Supervisory control & data acquisition	16.0	17.2	89.0	36.7	70.0	53.2	45.3	48.9	34.6	x	27.8
Int. expert systems for process control	72.1	-	57.9	25.7	46.4	53.2	3.1	-	3.8	x	-
Aut. environmental monitoring & control	-	17.2	91.9	39.6	76.0	53.2	35.0	90.2	48.9	x	26.1
Automated T.V. image analysis	16.0	-	15.7	19.2	23.6	42.6	40.6	-	1.6	x	10.1
AUTOMATED PROCESSING SYSTEMS											
Near-stream analysis	72.1	-	-	27.4	36.9	-	38.9	-	2.0	x	-
On-stream analysis (XRF)	-	17.2	73.3	33.9	62.6	95.8	51.7	46.8	50.1	x	-
On-stream size analysis	56.2	-	57.9	9.2	36.4	42.6	37.1	-	18.4	x	-
Flow density measurement	80.2	22.2	69.5	37.2	86.4	99.1	80.6	78.2	77.1	x	87.2
Inventory measurement	16.0	18.1	67.9	25.9	50.4	98.7	53.7	53.6	20.4	x	26.1

TABLE 17.1 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY MINES)

Newfoundland

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	30.0	33.3	33.3	33.3	33.3	-	70.0
Aut. conveyor - sequential analog	10.0	-	100.0	-	-	-	90.0
- computer control	10.0	100.0	100.0	-	-	-	90.0
Aut. slurry pumping - stop select	20.0	-	50.0	-	50.0	10.0	70.0
- var. speeds	30.0	33.3	100.0	-	-	10.0	60.0
Aut. handling equip. - ores	20.0	50.0	100.0	-	-	-	80.0
- slurries	20.0	50.0	50.0	50.0	-	10.0	70.0
- concentrates	10.0	100.0	100.0	-	-	-	90.0
- reagents	-	-	-	-	-	-	100.0
Computer controlled vehicle & equipment	10.0	-	100.0	-	-	10.0	80.0
Comp. based vehicle & equip. maintenance	20.0	50.0	50.0	50.0	-	20.0	60.0
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	30.0	-	66.7	-	-	10.0	60.0
- underground	-	-	-	-	-	-	100.0
Data communication networks - open pit	20.0	50.0	100.0	-	-	-	80.0
Underground data communication networks	10.0	100.0	100.0	-	-	-	90.0
In plant data networks linking aut. processes	10.0	100.0	-	-	100.0	10.0	80.0
CONTROL							
Analog controllers	20.0	50.0	50.0	-	50.0	-	80.0
Programmable logic controllers (PLC)	30.0	66.7	33.3	33.3	33.3	10.0	60.0
On-line statistical process control	10.0	100.0	100.0	-	-	10.0	80.0
Supervisory control & data acquisition	10.0	100.0	100.0	-	-	-	90.0
Int. expert systems for process control	20.0	100.0	100.0	-	-	-	80.0
Aut. environmental monitoring & control	-	-	-	-	-	10.0	90.0
Automated T.V. image analysis	10.0	-	100.0	-	-	-	90.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	20.0	50.0	100.0	-	-	-	80.0
On-stream analysis (XRF)	-	-	-	-	-	10.0	90.0
On-stream size analysis	10.0	-	100.0	-	-	10.0	80.0
Flow density measurement	30.0	33.3	100.0	-	-	20.0	50.0
Inventory measurement	10.0	100.0	-	-	100.0	-	90.0

TABLE 17.2 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY EMPLOYEES)

Newfoundland

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	80.2	19.9	10.1	70.0	19.9	-	19.8
Aut. conveyor - sequential analog	56.2	-	100.0	-	-	-	43.8
- computer control	16.0	100.0	100.0	-	-	-	84.0
Aut. slurry pumping - stop select	24.0	-	33.6	-	66.4	10.3	65.6
- var. speeds	80.2	70.0	100.0	-	-	10.3	9.4
Aut. handling equip. - ores	72.1	22.1	100.0	-	-	-	27.9
- slurries	72.1	22.1	22.1	77.9	-	10.3	17.5
- concentrates	16.0	100.0	100.0	-	-	-	84.0
- reagents	-	-	-	-	-	-	100.0
Computer controlled vehicle & equip.	56.2	-	100.0	-	-	10.3	33.5
Comp. based vehicle & equip. maintenance	24.0	66.4	66.4	33.6	-	66.5	9.4
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	82.5	-	87.5	-	-	1.0	16.5
- underground	-	-	-	-	-	-	100.0
Data communication networks - open pit	72.1	22.1	100.0	-	-	-	27.9
Underground data communication networks	3.4	100.0	100.0	-	-	-	96.6
In plant data networks linking aut. proc.	16.0	100.0	-	-	100.0	56.2	27.9
CONTROL							
Analog controllers	24.0	66.4	33.6	-	66.4	-	76.0
Programmable logic controllers (PLC)	80.2	89.9	70.0	10.1	19.9	10.3	9.4
On-line statistical process control	56.2	100.0	100.0	-	-	16.0	27.9
Supervisory control & data acquisition	16.0	100.0	100.0	-	-	-	84.0
Int. expert systems for process control	72.1	100.0	100.0	-	-	-	27.9
Aut. environmental monitoring & control	-	-	-	-	-	56.2	43.8
Automated T.V. image analysis	16.0	-	100.0	-	-	-	84.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	72.1	22.1	100.0	-	-	-	27.9
On-stream analysis (XRF)	-	-	-	-	-	16.0	84.0
On-stream size analysis	56.2	-	100.0	-	-	10.3	33.5
Flow density measurement	80.2	19.9	100.0	-	-	13.7	6.0
in-ventory measurement	16.0	100.0	-	-	100.0	-	84.0

TABLE 18.1 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY MINES)

Nova Scotia

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	21.4	-	33.3	33.3	-	7.1	71.4
Aut. conveyor - sequential analog	7.1	-	100.0	-	-	-	92.9
- computer control	7.1	-	100.0	-	-	21.4	71.4
Aut. slurry pumping - stop select	7.1	-	100.0	-	-	7.1	85.7
- var. speeds	14.3	-	100.0	-	-	14.3	71.4
Aut. handling equip. - ores	7.1	-	100.0	-	-	-	92.9
- slurries	7.1	-	100.0	-	-	7.1	85.7
- concentrates	-	-	-	-	-	7.1	92.9
- reagents	7.1	-	100.0	-	-	-	92.9
Computer controlled vehicle & equipment	-	-	-	-	-	14.3	85.7
Comp. based vehicle & equip. maintenance	14.3	-	100.0	-	-	7.1	78.6
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	42.9	16.7	50.0	16.7	16.7	-	57.1
- underground	7.1	-	100.0	-	-	7.1	85.7
Data communication networks - open pit	7.1	-	-	-	-	7.1	85.7
Underground data communication networks	-	-	-	-	-	7.1	92.9
In plant data networks linking aut. processes	7.1	-	100.0	-	-	7.1	85.7
CONTROL							
Analog controllers	21.4	-	100.0	-	-	-	78.6
Programmable logic controllers (PLC)	28.6	25.0	75.0	-	-	14.3	57.1
On-line statistical process control	-	-	-	-	-	14.3	85.7
Supervisory control & data acquisition	7.1	-	100.0	-	-	14.3	78.6
Int. expert systems for process control	-	-	-	-	-	7.1	92.9
Aut. environmental monitoring & control	7.1	-	100.0	-	-	7.1	85.7
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	7.1	100.0	100.0	-	-	7.1	85.7
On-stream size analysis	-	-	-	-	-	7.1	92.9
Flow density measurement	14.3	50.0	50.0	-	-	7.1	78.6
Inventory measurement	14.3	-	50.0	-	-	7.1	78.6

TABLE 18.2 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY EMPLOYEES)

Nova Scotia

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	40.7	-	17.8	42.2	-	6.2	53.1
Aut. conveyor - sequential analog	17.2	-	100.0	-	-	-	82.8
- computer control	7.2	-	100.0	-	-	44.3	48.4
Aut. slurry pumping - stop select	17.2	-	100.0	-	-	16.3	66.5
- var. speeds	23.3	-	100.0	-	-	36.2	40.4
Aut. handling equip. - ores	17.2	-	100.0	-	-	-	82.8
- slurries	17.2	-	100.0	-	-	19.9	62.9
- concentrates	-	-	-	-	-	17.2	82.8
- reagents	17.2	-	100.0	-	-	-	82.8
Computer controlled vehicle & equip.	-	-	-	-	-	13.4	86.6
Comp. based vehicle & equip. maintenance	23.3	-	100.0	-	-	16.3	60.4
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	51.4	14.1	61.9	14.1	14.1	-	48.6
- underground	3.5	-	100.0	-	-	19.9	76.6
Data communication networks - open pit	5.1	-	-	-	-	7.2	87.7
Underground data communication networks	-	-	-	-	-	19.9	80.1
In plant data networks linking aut. proc.	17.2	-	100.0	-	-	19.9	62.9
CONTROL							
Analog controllers	39.6	-	100.0	-	-	-	60.4
Programmable logic controllers (PLC)	44.7	36.5	88.7	-	-	27.2	28.1
On-line statistical process control	-	-	-	-	-	26.1	73.9
Supervisory control & data acquisition	17.2	-	100.0	-	-	26.1	56.7
Int. expert systems for process control	-	-	-	-	-	17.2	82.8
Aut. environmental monitoring & control	17.2	-	100.0	-	-	19.9	62.9
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	17.2	100.0	100.0	-	-	19.9	62.9
On-stream size analysis	-	-	-	-	-	19.9	80.1
Flow density measurement	22.2	77.2	77.2	-	-	19.9	57.8
in-ventory measurement	18.1	-	72.0	-	-	7.2	74.6

TABLE 19.1 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY MINES)

New Brunswick

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	37.5	33.3	33.3	66.7	-	25.0	37.5
Aut. conveyor - sequential analog	50.0	25.0	75.0	-	-	12.5	37.5
- computer control	37.5	33.3	100.0	-	-	12.5	50.0
Aut. slurry pumping - stop select	25.0	-	100.0	-	-	-	75.0
- var. speeds	50.0	25.0	100.0	-	-	-	50.0
Aut. handling equip. - ores	25.0	-	100.0	-	-	25.0	50.0
- slurries	50.0	-	100.0	-	-	-	50.0
- concentrates	37.5	-	100.0	-	-	12.5	50.0
- reagents	37.5	33.3	100.0	-	-	12.5	50.0
Computer controlled vehicle & equipment	-	-	-	-	-	12.5	87.5
Comp. based vehicle & equip. maintenance	25.0	50.0	50.0	-	-	25.0	50.0
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	25.0	-	50.0	-	-	-	75.0
- underground	12.5	-	100.0	-	-	-	87.5
Data communication networks - open pit	12.5	-	100.0	-	-	-	87.5
Underground data communication networks	25.0	100.0	100.0	-	-	-	75.0
In plant data networks linking aut. processes	50.0	25.0	100.0	-	-	-	50.0
CONTROL							
Analog controllers	37.5	-	100.0	-	-	-	62.5
Programmable logic controllers (PLC)	62.5	20.0	100.0	-	-	-	37.5
On-line statistical process control	25.0	-	100.0	-	-	37.5	37.5
Supervisory control & data acquisition	62.5	20.0	80.0	-	-	-	37.5
Int. expert systems for process control	25.0	50.0	100.0	-	-	12.5	62.5
Aut. environmental monitoring & control	62.5	20.0	80.0	-	-	-	37.5
Automated T.V. image analysis	12.5	-	100.0	-	-	12.5	75.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	50.0	25.0	100.0	-	-	-	50.0
On-stream size analysis	25.0	-	50.0	50.0	-	-	75.0
Flow density measurement	37.5	33.3	100.0	-	-	-	62.5
Inventory measurement	37.5	33.3	66.7	-	-	-	62.5

TABLE 19.2 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY EMPLOYEES)

New Brunswick

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	77.0	64.4	15.2	84.8	-	12.1	11.0
Aut. conveyor - sequential analog	83.6	59.3	92.0	-	-	8.3	8.1
- computer control	77.0	64.4	100.0	-	-	8.3	14.8
Aut. slurry pumping - stop select	15.5	-	100.0	-	-	-	84.5
- var. speeds	80.8	61.4	100.0	-	-	-	19.2
Aut. handling equip. - ores	27.4	-	100.0	-	-	57.9	14.8
- slurries	80.8	-	100.0	-	-	-	19.2
- concentrates	31.2	-	100.0	-	-	49.6	19.2
- reagents	77.0	64.4	100.0	-	-	3.8	19.2
Computer controlled vehicle & equip.	-	-	-	-	-	8.3	91.7
Comp. based vehicle & equip. maintenance	56.3	88.1	88.1	-	-	12.1	31.7
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	14.9	-	55.3	-	-	-	85.1
- underground	11.7	-	100.0	-	-	-	88.3
Data communication networks - open pit	8.3	-	100.0	-	-	-	91.7
Underground data communication networks	61.3	100.0	100.0	-	-	-	38.7
In plant data networks linking aut. proc.	85.2	58.2	100.0	-	-	-	14.8
CONTROL							
Analog controllers	65.1	-	100.0	-	-	-	34.9
Programmable logic controllers (PLC)	89.0	55.7	100.0	-	-	-	11.0
On-line statistical process control	24.0	-	100.0	-	-	65.1	11.0
Supervisory control & data acquisition	89.0	55.7	95.7	-	-	-	11.0
Int. expert systems for process control	57.9	85.7	100.0	-	-	3.8	38.3
Aut. environmental monitoring & control	91.9	54.0	92.7	-	-	-	8.1
Automated T.V. image analysis	15.7	-	100.0	-	-	8.3	76.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	73.3	5.2	100.0	-	-	-	26.7
On-stream size analysis	57.9	-	14.3	85.7	-	-	42.1
Flow density measurement	69.5	71.3	100.0	-	-	-	30.5
Inventory measurement	67.9	73.0	90.2	-	-	-	32.1

TABLE 20.1 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY MINES)

Quebec

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	32.8	21.1	78.9	15.8	-	12.1	55.2
Aut. conveyor - sequential analog	36.2	33.3	90.5	4.8	-	5.2	58.6
- computer control	19.0	45.5	72.7	9.1	9.1	6.9	74.1
Aut. slurry pumping - stop select	15.5	22.2	66.7	22.2	-	8.6	75.9
- var. speeds	13.8	37.5	75.0	12.5	-	12.1	74.1
Aut. handling equip. - ores	15.5	22.2	77.8	-	-	8.6	75.9
- slurries	10.3	50.0	66.7	33.3	-	8.6	81.0
- concentrates	19.0	27.3	81.8	9.1	-	8.6	72.4
- reagents	15.5	55.6	55.6	22.2	-	8.6	75.9
Computer controlled vehicle & equipment	13.8	50.0	75.0	-	-	13.8	72.4
Comp. based vehicle & equip. maintenance	19.0	54.5	63.6	9.1	-	6.9	74.1
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	17.2	10.0	80.0	10.0	-	1.7	81.0
- underground	13.8	37.5	75.0	12.5	-	10.3	75.9
Data communication networks - open pit	6.9	25.0	75.0	-	-	-	93.1
Underground data communication networks	17.2	-	70.0	-	-	8.6	74.1
In plant data networks linking aut. processes	15.5	44.4	77.8	-	11.1	5.2	79.3
CONTROL							
Analog controllers	27.6	31.3	87.5	-	6.3	6.9	65.5
Programmable logic controllers (PLC)	36.2	42.9	81.0	-	14.3	17.2	46.6
On-line statistical process control	6.9	50.0	75.0	-	25.0	20.7	72.4
Supervisory control & data acquisition	17.2	50.0	90.0	-	-	13.8	69.0
Int. expert systems for process control	10.3	66.7	83.3	-	16.7	8.6	81.0
Aut. environmental monitoring & control	13.8	37.5	75.0	12.5	12.5	12.1	74.1
Automated T.V. image analysis	10.3	50.0	83.3	-	-	6.9	82.8
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	17.2	30.0	90.0	-	-	12.1	70.7
On-stream analysis (XRF)	20.7	41.7	91.7	-	-	12.1	67.2
On-stream size analysis	3.4	50.0	50.0	-	-	8.6	87.9
Flow density measurement	22.4	30.8	84.6	-	7.7	12.1	65.5
Inventory measurement	17.2	30.0	70.0	20.0	10.0	6.9	75.9

TABLE 20.2 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY EMPLOYEES)

Quebec

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	59.5	13.5	78.5	14.1	-	8.9	31.7
Aut. conveyor - sequential analog	54.8	41.2	87.2	4.7	-	6.1	39.1
- computer control	52.0	51.4	79.1	5.0	7.4	5.1	43.0
Aut. slurry pumping - stop select	42.4	13.2	78.2	11.3	-	7.3	50.3
- var. speeds	24.6	41.8	71.6	10.5	-	8.3	67.0
Aut. handling equip. - ores	42.8	18.1	86.3	-	-	11.2	46.1
- slurries	21.0	49.0	81.6	18.4	-	9.3	69.6
- concentrates	44.9	40.4	84.4	5.7	-	9.8	45.3
- reagents	27.1	47.7	52.0	26.9	-	11.0	61.8
Computer controlled vehicle & equip.	24.9	49.7	76.6	-	-	10.3	64.8
Comp. based vehicle & equip. maintenance	28.5	53.4	53.0	9.0	-	5.9	65.6
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	43.9	17.6	82.3	17.6	-	1.3	54.8
- underground	30.1	14.6	77.9	7.4	-	11.1	58.8
Data communication networks - open pit	25.0	30.9	99.8	-	-	-	75.0
Underground data communication networks	22.6	-	70.6	-	-	6.1	71.3
In plant data networks linking aut. proc.	34.5	29.6	88.4	-	7.5	1.8	63.7
CONTROL							
Analog controllers	56.0	29.6	87.5	-	4.6	6.5	37.5
Programmable logic controllers (PLC)	61.0	51.3	79.3	-	13.4	19.6	19.4
On-line statistical process control	11.3	49.2	77.3	-	22.7	38.7	49.9
Supervisory control & data acquisition	36.7	50.6	95.3	-	-	10.5	52.7
Int. expert systems for process control	25.7	28.1	90.0	-	10.0	16.2	58.1
Aut. environmental monitoring & control	39.6	33.7	83.7	9.8	6.5	12.6	47.9
Automated T.V. image analysis	19.2	57.2	76.9	-	-	4.1	76.7
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	27.4	41.9	83.8	-	-	9.0	63.7
On-stream analysis (XRF)	33.9	24.6	86.9	-	-	14.1	52.0
On-stream size analysis	9.2	51.6	51.6	-	-	14.2	76.7
Flow density measurement	37.2	36.4	81.2	-	6.9	7.8	55.0
Inventory measurement	25.9	28.7	48.8	41.2	10.0	9.7	64.4

TABLE 21.1 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY MINES)

Ontario

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	69.8	43.2	81.1	10.8	5.4	-	30.2
Aut. conveyor - sequential analog	45.3	16.7	83.3	4.2	8.3	-	54.7
- computer control	37.7	40.0	80.0	-	15.0	7.5	54.7
Aut. slurry pumping - stop select	39.6	23.8	100.0	-	-	7.5	52.8
- var. speeds	41.5	36.4	100.0	-	-	5.7	52.8
Aut. handling equip. - ores	45.3	37.5	87.5	4.2	8.3	3.8	50.9
- slurries	35.8	15.8	94.7	-	5.3	5.7	58.5
- concentrates	24.5	23.1	100.0	-	-	5.7	69.8
- reagents	34.0	22.2	100.0	-	-	11.3	54.7
Computer controlled vehicle & equipment	15.1	25.0	75.0	12.5	12.5	9.4	75.5
Comp. based vehicle & equip. maintenance	35.8	26.3	78.9	15.8	5.3	15.1	49.1
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	22.6	8.3	83.3	8.3	-	-	77.4
- underground	28.3	20.0	86.7	6.7	-	7.5	64.2
Data communication networks - open pit	5.7	-	100.0	-	-	1.9	92.5
Underground data communication networks	24.5	53.8	92.3	-	7.7	13.2	62.3
In plant data networks linking aut. processes	45.3	29.2	79.2	8.3	4.2	9.4	45.3
CONTROL							
Analog controllers	62.3	24.2	75.8	12.1	3.0	3.8	34.0
Programmable logic controllers (PLC)	69.8	35.1	78.4	8.1	5.4	7.5	22.6
On-line statistical process control	24.5	23.1	92.3	-	-	11.3	64.2
Supervisory control & data acquisition	32.1	29.4	82.4	5.9	-	11.3	56.6
Int. expert systems for process control	20.8	27.3	81.8	18.2	-	9.4	69.8
Aut. environmental monitoring & control	39.6	38.1	81.0	14.3	-	5.7	54.7
Automated T.V. image analysis	9.4	-	100.0	-	-	1.9	88.7
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	18.9	10.0	100.0	-	-	1.9	79.2
On-stream analysis (XRF)	26.4	14.3	92.9	-	-	3.8	69.8
On-stream size analysis	13.2	-	100.0	-	-	3.8	83.0
Flow density measurement	54.7	20.7	93.1	6.9	-	5.7	39.6
Inventory measurement	34.0	22.2	94.4	5.6	-	7.5	58.5

TABLE 21.2 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY EMPLOYEES)

Ontario

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	90.0	52.4	75.6	20.9	3.3	-	10.0
Aut. conveyor - sequential analog	65.3	14.1	95.2	0.8	3.5	-	34.7
- computer control	64.8	44.1	93.7	-	5.7	5.4	29.8
Aut. slurry pumping - stop select	48.1	48.1	100.0	-	-	11.1	40.8
- var. speeds	77.5	47.2	100.0	-	-	2.7	19.9
Aut. handling equip. - ores	71.6	42.3	87.2	0.5	12.3	0.5	27.9
- slurries	65.8	20.8	88.7	-	11.3	1.1	33.0
- concentrates	54.4	25.1	100.0	-	-	1.1	44.4
- reagents	74.3	19.3	100.0	-	-	4.5	21.3
Computer controlled vehicle & equip.	34.5	25.4	37.3	2.5	60.2	14.7	50.8
Comp. based vehicle & equip. maintenance	59.4	13.6	52.2	12.9	34.9	5.6	35.0
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	33.5	2.1	94.4	0.3	-	-	66.5
- underground	59.6	38.1	95.5	1.6	-	4.1	36.3
Data communication networks - open pit	22.7	-	100.0	-	-	0.6	76.7
Underground data communication networks	52.2	87.9	60.3	-	39.7	17.1	30.7
In plant data networks linking aut. proc.	81.2	33.7	65.6	4.1	25.6	4.0	14.9
CONTROL							
Analog controllers	87.2	25.4	89.3	7.4	1.1	2.3	10.5
Programmable logic controllers (PLC)	85.8	38.6	94.0	1.8	1.9	6.5	7.7
On-line statistical process control	38.9	17.4	99.7	-	-	24.8	36.3
Supervisory control & data acquisition	70.0	34.8	91.5	5.9	-	6.1	23.9
Int. expert systems for process control	46.4	30.9	77.6	22.4	-	13.6	40.0
Aut. environmental monitoring & control	76.0	49.6	86.2	11.9	-	4.2	19.9
Automated T.V. image analysis	23.6	-	100.0	-	-	0.2	76.2
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	36.9	2.5	100.0	-	-	0.4	62.7
On-stream analysis (XRF)	62.6	9.9	99.0	-	-	1.1	36.3
On-stream size analysis	36.4	-	100.0	-	-	10.7	52.9
Flow density measurement	86.4	20.6	96.1	3.9	-	4.9	8.7
Inventory measurement	50.4	26.0	97.4	2.6	-	21.2	28.4

TABLE 22.1 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY MINES)

Manitoba

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	25.0	50.0	50.0	50.0	-	-	75.0
Aut. conveyor - sequential analog	37.5	-	100.0	-	-	-	62.5
- computer control	12.5	-	100.0	-	-	-	87.5
Aut. slurry pumping - stop select	12.5	100.0	100.0	-	-	-	87.5
- var. speeds	12.5	-	100.0	-	-	12.5	75.0
Aut. handling equip. - ores	37.5	33.3	-	33.3	-	-	62.5
- slurries	37.5	33.3	-	33.3	-	-	62.5
- concentrates	37.5	33.3	-	33.3	-	-	62.5
- reagents	37.5	33.3	33.3	-	-	-	62.5
Computer controlled vehicle & equipment	37.5	100.0	-	-	-	-	62.5
Comp. based vehicle & equip. maintenance	25.0	100.0	-	-	-	12.5	62.5
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	50.0	-	25.0	-	-	-	50.0
- underground	37.5	33.3	33.3	-	-	12.5	50.0
Data communication networks - open pit	-	-	-	-	-	-	100.0
Underground data communication networks	37.5	33.3	33.3	-	-	-	62.5
In plant data networks linking aut. processes	12.5	100.0	-	-	-	50.0	37.5
CONTROL							
Analog controllers	37.5	-	100.0	-	-	-	62.5
Programmable logic controllers (PLC)	25.0	100.0	100.0	-	-	12.5	62.5
On-line statistical process control	12.5	100.0	100.0	-	-	25.0	62.5
Supervisory control & data acquisition	12.5	100.0	100.0	-	-	-	87.5
Int. expert systems for process control	12.5	100.0	-	-	-	25.0	62.5
Aut. environmental monitoring & control	12.5	-	-	-	100.0	12.5	75.0
Automated T.V. image analysis	25.0	-	-	-	-	-	75.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	37.5	100.0	33.3	-	-	-	62.5
On-stream size analysis	25.0	-	-	-	-	12.5	62.5
Flow density measurement	62.5	20.0	40.0	20.0	-	-	37.5
Inventory measurement	50.0	-	25.0	25.0	-	12.5	37.5

TABLE 22.2 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY EMPLOYEES)

Manitoba

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	56.1	5.0	5.0	95.0	-	-	43.9
Aut. conveyor - sequential analog	56.5	-	100.0	-	-	-	43.5
- computer control	53.2	-	100.0	-	-	-	46.8
Aut. slurry pumping - stop select	53.2	100.0	100.0	-	-	-	46.8
- var. speeds	53.2	-	100.0	-	-	2.8	43.9
Aut. handling equip. - ores	95.8	55.6	-	55.6	-	-	4.2
- slurries	95.8	55.6	-	55.6	-	-	4.2
- concentrates	95.8	55.6	-	55.6	-	-	4.2
- reagents	95.8	55.6	55.6	-	-	-	4.2
Computer controlled vehicle & equip.	95.8	100.0	-	-	-	-	4.2
Comp. based vehicle & equip. maintenance	42.6	100.0	-	-	-	0.7	56.7
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	96.2	-	0.4	-	-	-	3.8
- underground	95.8	55.6	55.6	-	-	2.8	1.3
Data communication networks - open pit	-	-	-	-	-	-	100.0
Underground data communication networks	95.8	55.6	55.6	-	-	-	4.2
In plant data networks linking aut. proc.	53.2	100.0	-	-	-	46.1	0.7
CONTROL							
Analog controllers	56.7	-	100.0	-	-	-	43.3
Programmable logic controllers (PLC)	56.1	100.0	100.0	-	-	0.7	43.3
On-line statistical process control	53.2	100.0	100.0	-	-	3.2	43.5
Supervisory control & data acquisition	53.2	100.0	100.0	-	-	-	46.8
Int. expert systems for process control	53.2	100.0	-	-	-	42.6	4.2
Aut. environmental monitoring & control	53.2	-	-	-	100.0	2.8	43.9
Automated T.V. image analysis	42.6	-	-	-	-	-	57.4
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	95.8	100.0	55.6	-	-	-	4.2
On-stream size analysis	42.6	-	-	-	-	53.2	4.2
Flow density measurement	99.1	2.8	3.3	53.7	-	-	0.9
Inventory measurement	98.7	-	2.9	54.0	-	0.4	0.9

TABLE 23.1 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY MINES)

Saskatchewan

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	56.0	7.1	78.6	7.1	-	-	44.0
Aut. conveyor - sequential analog	36.0	-	100.0	-	-	-	64.0
- computer control	44.0	18.2	100.0	-	-	4.0	52.0
Aut. slurry pumping - stop select	48.0	16.7	100.0	-	-	-	52.0
- var. speeds	24.0	-	83.3	16.7	-	8.0	68.0
Aut. handling equip. - ores	28.0	14.3	85.7	-	-	-	72.0
- slurries	32.0	37.5	87.5	-	-	-	68.0
- concentrates	28.0	28.6	71.4	-	-	-	72.0
- reagents	32.0	37.5	75.0	-	-	4.0	64.0
Computer controlled vehicle & equipment	16.0	50.0	25.0	50.0	-	16.0	68.0
Comp. based vehicle & equip. maintenance	44.0	27.3	63.6	27.3	-	8.0	48.0
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	32.0	-	75.0	12.5	-	-	68.0
- underground	20.0	-	40.0	40.0	-	8.0	72.0
Data communication networks - open pit	8.0	50.0	100.0	-	-	-	92.0
Underground data communication networks	16.0	50.0	50.0	-	-	8.0	76.0
In plant data networks linking aut. processes	36.0	33.3	100.0	-	-	8.0	56.0
CONTROL							
Analog controllers	52.0	7.7	92.3	-	-	4.0	44.0
Programmable logic controllers (PLC)	60.0	33.3	86.7	-	6.7	-	40.0
On-line statistical process control	28.0	42.9	85.7	-	14.3	4.0	68.0
Supervisory control & data acquisition	28.0	42.9	85.7	14.3	-	4.0	68.0
Int. expert systems for process control	8.0	50.0	100.0	-	-	12.0	80.0
Aut. environmental monitoring & control	16.0	50.0	75.0	-	25.0	8.0	76.0
Automated T.V. image analysis	12.0	33.3	33.3	33.3	-	-	88.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	16.0	25.0	75.0	25.0	-	-	84.0
On-stream analysis (XRF)	24.0	66.7	83.3	-	-	-	76.0
On-stream size analysis	16.0	50.0	50.0	-	25.0	4.0	80.0
Flow density measurement	52.0	15.4	84.6	-	-	4.0	44.0
Inventory measurement	28.0	14.3	71.4	14.3	-	8.0	64.0

TABLE 23.2 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY EMPLOYEES)

Saskatchewan

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	74.2	25.5	87.5	3.1	-	-	25.8
Aut. conveyor - sequential analog	47.5	-	100.0	-	-	-	52.5
- computer control	66.6	39.1	100.0	-	-	3.2	30.2
Aut. slurry pumping - stop select	62.0	12.8	100.0	-	-	-	38.0
- var. speeds	31.6	-	79.1	20.9	-	3.9	64.5
Aut. handling equip. - ores	58.6	32.2	74.2	-	-	-	41.4
- slurries	65.0	41.3	76.7	-	-	-	35.0
- concentrates	59.4	43.9	69.3	-	-	-	40.6
- reagents	60.2	44.6	69.6	-	-	6.2	33.6
Computer controlled vehicle & equip.	42.4	80.2	1.1	63.3	-	20.7	36.9
Comp. based vehicle & equip. maintenance	73.8	55.8	67.0	12.6	-	3.1	23.0
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	48.8	-	61.3	7.7	-	-	51.2
- underground	32.6	-	39.3	14.4	-	7.9	59.4
Data communication networks - open pit	5.5	42.8	100.0	-	-	-	94.5
Underground data communication networks	40.9	48.0	61.2	-	-	13.8	45.3
In plant data networks linking aut. proc.	50.8	57.6	100.0	-	-	17.5	31.7
CONTROL							
Analog controllers	60.0	31.5	96.1	-	-	0.5	39.5
Programmable logic controllers (PLC)	74.5	47.6	96.6	-	2.4	-	25.5
On-line statistical process control	44.0	64.2	92.8	-	7.2	7.2	48.8
Supervisory control & data acquisition	45.3	62.8	85.4	14.6	-	2.4	52.3
Int. expert systems for process control	3.1	24.5	100.0	-	-	41.2	55.7
Aut. environmental monitoring & control	35.0	74.5	93.4	-	6.6	3.1	61.8
Automated T.V. image analysis	40.6	46.5	16.3	46.5	-	-	59.4
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	38.9	48.5	51.5	48.5	-	-	61.1
On-stream analysis (XRF)	51.7	81.1	70.8	-	-	-	48.3
On-stream size analysis	37.1	53.0	53.0	-	6.3	7.2	55.7
Flow density measurement	80.6	32.3	78.3	-	-	0.5	18.9
Inventory measurement	53.7	35.2	66.0	5.9	-	7.7	38.7

TABLE 24.1 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY MINES)

Alberta

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	37.5	-	66.7	-	-	-	62.5
Aut. conveyor - sequential analog	25.0	-	100.0	-	-	-	75.0
- computer control	-	-	-	-	-	12.5	87.5
Aut. slurry pumping - stop select	37.5	-	66.7	33.3	-	-	62.5
- var. speeds	25.0	-	50.0	50.0	-	-	75.0
Aut. handling equip. - ores	-	-	-	-	-	12.5	87.5
- slurries	12.5	-	-	-	-	12.5	75.0
- concentrates	-	-	-	-	-	12.5	87.5
- reagents	-	-	-	-	-	12.5	87.5
Computer controlled vehicle & equipment	12.5	-	100.0	-	-	-	87.5
Comp. based vehicle & equip. maintenance	37.5	66.7	100.0	-	-	12.5	50.0
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	50.0	-	100.0	-	-	-	50.0
- underground	12.5	-	100.0	-	-	-	87.5
Data communication networks - open pit	25.0	-	100.0	-	-	12.5	62.5
Underground data communication networks	-	-	-	-	-	-	100.0
In plant data networks linking aut. processes	12.5	-	100.0	-	-	12.5	75.0
CONTROL							
Analog controllers	50.0	-	100.0	-	-	-	50.0
Programmable logic controllers (PLC)	62.5	40.0	80.0	-	20.0	-	37.5
On-line statistical process control	12.5	-	-	-	100.0	12.5	75.0
Supervisory control & data acquisition	25.0	50.0	100.0	-	-	12.5	62.5
Int. expert systems for process control	-	-	-	-	-	12.5	87.5
Aut. environmental monitoring & control	50.0	-	100.0	-	-	-	50.0
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	12.5	100.0	100.0	-	-	-	87.5
On-stream size analysis	-	-	-	-	-	-	100.0
Flow density measurement	50.0	-	100.0	-	-	-	50.0
Inventory measurement	25.0	-	100.0	-	-	-	75.0

TABLE 24.2 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY EMPLOYEES)

Alberta

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	43.4	-	50.3	-	-	-	56.6
Aut. conveyor - sequential analog	40.3	-	100.0	-	-	-	59.7
- computer control	-	-	-	-	-	21.5	78.5
Aut. slurry pumping - stop select	31.4	-	78.4	21.6	-	-	68.6
- var. speeds	28.3	-	76.0	24.0	-	-	71.7
Aut. handling equip. - ores	-	-	-	-	-	21.5	78.5
- slurries	6.8	-	-	-	-	21.5	71.7
- concentrates	-	-	-	-	-	21.5	78.5
- reagents	-	-	-	-	-	21.5	78.5
Computer controlled vehicle & equip.	6.8	-	100.0	-	-	-	93.2
Comp. based vehicle & equip. maintenance	55.7	87.8	100.0	-	-	18.7	25.6
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	43.3	-	100.0	-	-	-	56.7
- underground	21.5	-	100.0	-	-	-	78.5
Data communication networks - open pit	28.3	-	100.0	-	-	18.7	52.9
Underground data communication networks	-	-	-	-	-	-	100.0
In plant data networks linking aut. proc.	46.8	-	100.0	-	-	21.5	31.6
CONTROL							
Analog controllers	73.5	-	100.0	-	-	-	26.5
Programmable logic controllers (PLC)	95.9	71.3	92.9	-	7.1	-	4.1
On-line statistical process control	6.8	-	-	-	100.0	21.5	71.7
Supervisory control & data acquisition	48.9	95.8	100.0	-	-	21.5	29.6
Int. expert systems for process control	-	-	-	-	-	21.5	78.5
Aut. environmental monitoring & control	90.2	-	100.0	-	-	-	9.8
Automated T.V. image analysis	-	-	-	-	-	-	100.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	46.8	100.0	100.0	-	-	-	53.2
On-stream size analysis	-	-	-	-	-	-	100.0
Flow density measurement	78.2	-	100.0	-	-	-	21.8
Inventory measurement	53.6	-	100.0	-	-	-	46.4

TABLE 25.1 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY MINES)

British Columbia

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	53.8	23.8	85.7	9.5	-	2.6	43.6
Aut. conveyor - sequential analog	35.9	14.3	78.6	-	-	2.6	61.5
- computer control	33.3	15.4	92.3	-	-	10.3	56.4
Aut. slurry pumping - stop select	48.7	10.5	89.5	-	-	5.1	46.2
- var. speeds	43.6	11.8	82.4	5.9	-	10.3	46.2
Aut. handling equip. - ores	35.9	14.3	78.6	-	7.1	7.7	56.4
- slurries	38.5	26.7	93.3	-	-	12.8	48.7
- concentrates	23.1	11.1	88.9	-	-	10.3	66.7
- reagents	25.6	40.0	80.0	-	10.0	17.9	56.4
Computer controlled vehicle & equipment	12.8	-	100.0	-	-	7.7	79.5
Comp. based vehicle & equip. maintenance	30.8	25.0	75.0	25.0	-	12.8	56.4
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	66.7	7.7	69.2	7.7	-	2.6	30.8
- underground	7.7	-	66.7	-	-	7.7	84.6
Data communication networks - open pit	17.9	28.6	57.1	14.3	14.3	15.4	66.7
Underground data communication networks	5.1	-	100.0	-	-	5.1	89.7
In plant data networks linking aut. processes	23.1	44.4	88.9	-	-	17.9	59.0
CONTROL							
Analog controllers	56.4	18.2	59.1	4.5	-	7.7	35.9
Programmable logic controllers (PLC)	56.4	45.5	63.6	-	4.5	10.3	33.3
On-line statistical process control	12.8	60.0	40.0	-	-	28.2	59.0
Supervisory control & data acquisition	15.4	50.0	66.7	-	-	23.1	61.5
Int. expert systems for process control	5.1	-	-	-	-	23.1	71.8
Aut. environmental monitoring & control	30.8	16.7	58.3	8.3	-	15.4	53.8
Automated T.V. image analysis	2.6	-	-	-	-	7.7	89.7
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	5.1	50.0	100.0	-	-	7.7	87.2
On-stream analysis (XRF)	25.6	20.0	80.0	-	-	10.3	64.1
On-stream size analysis	7.7	-	-	66.7	-	10.3	82.1
Flow density measurement	48.7	21.1	68.4	10.5	-	12.8	38.5
Inventory measurement	15.4	16.7	50.0	16.7	-	10.3	74.4

TABLE 25.2 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY EMPLOYEES)

British Columbia

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	85.9	18.4	83.0	15.9	-	0.2	13.8
Aut. conveyor - sequential analog	58.9	5.6	80.0	-	-	0.2	40.9
- computer control	52.7	5.9	99.5	-	-	10.4	36.9
Aut. slurry pumping - stop select	84.1	12.8	95.5	-	-	0.6	15.3
- var. speeds	63.8	9.4	79.9	14.1	-	12.8	23.4
Aut. handling equip. - ores	62.8	9.6	74.7	-	9.0	1.0	36.2
- slurries	66.4	22.4	95.7	-	-	13.3	20.3
- concentrates	45.9	3.7	83.9	-	-	4.7	49.4
- reagents	39.2	38.1	87.1	-	12.2	29.2	31.6
Computer controlled vehicle & equip.	31.8	-	100.0	-	-	3.5	64.6
Comp. based vehicle & equip. maintenance	54.5	16.3	92.7	7.3	-	10.0	35.5
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	81.0	0.7	74.0	15.2	-	0.2	18.8
- underground	14.0	-	93.3	-	-	1.0	85.0
Data communication networks - open pit	38.1	37.6	78.6	6.7	10.7	22.0	39.9
Underground data communication networks	13.0	-	100.0	-	-	0.6	86.4
In plant data networks linking aut. proc.	47.6	24.9	94.0	-	-	23.4	28.9
CONTROL							
Analog controllers	81.6	10.3	65.9	4.3	-	1.0	17.5
Programmable logic controllers (PLC)	84.1	51.1	69.8	-	3.6	8.1	7.8
On-line statistical process control	16.2	86.6	70.9	-	-	39.9	43.9
Supervisory control & data acquisition	34.6	42.5	82.6	-	-	26.8	38.6
Int. expert systems for process control	3.8	-	-	-	-	31.8	64.4
Aut. environmental monitoring & control	48.9	6.3	88.8	1.8	-	12.0	39.2
Automated T.V. image analysis	1.6	-	-	-	-	11.4	87.0
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	2.0	21.1	100.0	-	-	5.9	92.1
On-stream analysis (XRF)	50.1	33.8	89.2	-	-	25.0	24.9
On-stream size analysis	18.4	-	-	84.4	-	5.5	76.1
Flow density measurement	77.1	11.3	88.1	4.9	-	13.5	9.4
Inventory measurement	20.4	7.4	50.9	27.7	-	2.2	77.4

TABLE 26.1 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY MINES)

Northwest Territories

Technologies	YES					NO	
	Curre-ntly use	Plan to in-crease usage	Expect ations met	Expect ations not met	Expect ations exceed-ed	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	62.5	-	80.0	20.0	-	-	37.5
Aut. conveyor - sequential analog	37.5	-	66.7	-	33.3	-	62.5
- computer control	25.0	-	50.0	-	-	-	75.0
Aut. slurry pumping - stop select	62.5	-	80.0	-	-	-	37.5
- var. speeds	62.5	20.0	40.0	20.0	20.0	-	37.5
Aut. handling equip. - ores	25.0	-	50.0	-	-	12.5	62.5
- slurries	37.5	-	66.7	-	-	-	62.5
- concentrates	25.0	-	100.0	-	-	-	75.0
- reagents	25.0	-	50.0	-	-	12.5	62.5
Computer controlled vehicle & equipment	-	-	-	-	-	12.5	87.5
Comp. based vehicle & equip. maintenance	37.5	-	-	66.7	-	12.5	50.0
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	37.5	-	33.3	33.3	-	-	62.5
- underground	25.0	-	50.0	50.0	-	-	75.0
Data communication networks - open pit	-	-	-	-	-	-	100.0
Underground data communication networks	25.0	-	50.0	-	50.0	12.5	62.5
In plant data networks linking aut. processes	25.0	-	50.0	-	-	-	75.0
CONTROL							
Analog controllers	75.0	33.3	66.7	-	16.7	-	25.0
Programmable logic controllers (PLC)	75.0	16.7	50.0	16.7	16.7	-	25.0
On-line statistical process control	25.0	50.0	100.0	-	-	-	75.0
Supervisory control & data acquisition	12.5	100.0	100.0	-	-	-	87.5
Int. expert systems for process control	-	-	-	-	-	-	100.0
Aut. environmental monitoring & control	25.0	-	100.0	-	-	-	75.0
Automated T.V. image analysis	12.5	-	100.0	-	-	-	87.5
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	-	-	-	-	-	12.5	87.5
On-stream size analysis	-	-	-	-	-	12.5	87.5
Flow density measurement	75.0	16.7	66.7	-	-	-	25.0
Inventory measurement	25.0	-	100.0	-	-	-	75.0

TABLE 26.2 THE USE OF TECHNOLOGY BY PROVINCE OF OPERATION (WEIGHTED BY EMPLOYEES)

Northwest Territories

Technologies	YES					NO	
	Currently use	Plan to increase usage	Expectations met	Expectations not met	Expectations exceeded	Plan to use	No plan to use
	%	%	%	%	%	%	%
AUTOMATED MATERIAL HANDLING							
Automatic bin level measurement	67.0	-	84.9	15.1	-	-	33.0
Aut. conveyor - sequential analog	53.9	-	93.6	-	6.4	-	46.1
- computer control	45.9	-	60.5	-	-	-	54.1
Aut. slurry pumping - stop select	81.7	-	77.8	-	-	-	18.3
- var. speeds	75.1	4.0	34.8	4.0	37.0	-	24.9
Aut. handling equip. - ores	45.9	-	60.5	-	-	10.1	44.0
- slurries	68.6	-	73.6	-	-	-	31.4
- concentrates	25.7	-	100.0	-	-	-	74.3
- reagents	40.8	-	55.6	-	-	27.8	31.4
Computer controlled vehicle & equip.	-	-	-	-	-	3.0	97.0
Comp. based vehicle & equip. maintenance	56.0	-	-	67.6	-	3.0	40.9
COMMUNICATIONS & NETWORKS							
Radio based voice networks - open pit	24.6	-	14.0	12.3	-	-	75.4
- underground	50.5	-	44.9	55.1	-	-	49.5
Data communication networks - open pit	-	-	-	-	-	-	100.0
Underground data communication networks	50.5	-	44.9	-	55.1	10.1	39.4
In plant data networks linking aut. proc.	45.9	-	60.5	-	-	-	54.1
CONTROL							
Analog controllers	87.2	35.4	47.3	-	31.9	-	12.8
Programmable logic controllers (PLC)	87.2	3.5	43.3	31.9	4.0	-	12.8
On-line statistical process control	50.5	55.1	100.0	-	-	-	49.5
Supervisory control & data acquisition	27.8	100.0	100.0	-	-	-	72.2
Int. expert systems for process control	-	-	-	-	-	-	100.0
Aut. environmental monitoring & control	26.1	-	100.0	-	-	-	73.9
Automated T.V. image analysis	10.1	-	100.0	-	-	-	89.9
AUTOMATED PROCESSING SYSTEMS							
Near-stream analysis	-	-	-	-	-	-	100.0
On-stream analysis (XRF)	-	-	-	-	-	12.1	87.9
On-stream size analysis	-	-	-	-	-	27.8	72.2
Flow density measurement	87.2	3.5	65.3	-	-	-	12.8
Inventory measurement	26.1	-	100.0	-	-	-	73.9

TABLE 27.1 THE USE OF TECHNOLOGY BY SIZE OF OPERATION (WEIGHTED BY MINES)

Technologies	Currently use			Plan to use			No plan to use		
	%			%			%		
	Employees			Employees			Employees		
	0 - 49	50-249	> 249	0 - 49	50-249	> 249	0 - 49	50-249	> 249
AUTOMATED MATERIAL HANDLING	-	-	-	-	-	-	-	-	-
Automatic bin level measurement	16.4	41.9	78.0	6.0	7.0	2.4	77.6	51.2	19.5
Aut. conveyor - sequential analog	16.4	31.4	54.9	3.0	1.2	3.7	80.6	67.4	41.5
- computer control	3.0	17.4	56.1	7.5	8.1	8.5	89.6	74.4	35.4
Aut. slurry pumping - stop select	3.0	30.2	58.5	7.5	5.8	3.7	89.6	64.0	37.8
- var. speeds	3.0	25.6	56.1	10.4	8.1	9.8	86.6	66.3	34.1
Aut. handling equip. - ores	1.5	17.4	58.5	6.0	7.0	7.3	92.5	75.6	34.1
- slurries	1.5	17.4	57.3	4.5	8.1	7.3	94.0	74.4	35.4
- concentrates	1.5	16.3	42.7	4.5	9.3	4.9	94.0	74.4	52.4
- reagents	4.5	14.0	47.6	7.5	9.3	13.4	88.1	76.7	39.0
Computer controlled vehicle & equipment	3.0	10.5	24.4	6.0	12.8	12.2	91.0	76.7	63.4
Comp. based vehicle & equip. maintenance	9.0	24.4	51.2	11.9	14.0	9.8	79.1	61.6	39.0
COMMUNICATIONS & NETWORKS	-	-	-	-	-	-	-	-	-
Radio based voice networks - open pit	22.4	31.4	46.3	4.5	1.2	-	73.1	67.4	53.7
- underground	3.0	12.8	32.9	6.0	9.3	7.3	91.0	77.9	59.8
Data communication networks - open pit	1.5	7.0	18.3	4.5	3.5	3.7	94.0	89.5	78.0
Underground data communication networks	4.5	10.5	30.5	4.5	8.1	9.8	91.0	81.4	59.8
In plant data networks linking aut. processes	3.0	16.3	54.9	9.0	8.1	14.6	88.1	75.6	30.5
CONTROL	-	-	-	-	-	-	-	-	-
Analog controllers	13.4	45.3	70.7	4.5	5.8	2.4	82.1	48.8	26.8
Programmable logic controllers (PLC)	13.4	54.7	78.0	9.0	8.1	12.2	77.6	37.2	9.8
On-line statistical process control	4.5	10.5	29.3	13.4	12.8	23.2	82.1	76.7	47.6
Supervisory control & data acquisition	1.5	15.1	46.3	10.4	11.6	12.2	88.1	73.3	41.5
Int. expert systems for process control	6.0	4.7	22.0	7.5	8.1	18.3	86.6	87.2	59.8
Aut. environmental monitoring & control	1.5	19.8	50.0	6.0	11.6	8.5	92.5	68.6	41.5
Automated T.V. image analysis	3.0	7.0	14.6	6.0	3.5	2.4	91.0	89.5	82.9
AUTOMATED PROCESSING SYSTEMS	-	-	-	-	-	-	-	-	-
Near-stream analysis	6.0	5.8	23.2	6.0	4.7	3.7	88.1	89.5	73.2
On-stream analysis (XRF)	1.5	14.0	47.6	4.5	8.1	7.3	94.0	77.9	45.1
On-stream size analysis	1.5	3.5	20.7	3.0	5.8	11.0	95.5	90.7	68.3
Flow density measurement	9.0	36.0	74.4	7.5	8.1	8.5	83.6	55.8	17.1
Inventory measurement	3.0	24.4	39.0	10.4	5.8	4.9	86.6	69.8	56.1

TABLE 28.1 THE USE OF TECHNOLOGY BY MINING METHOD (WEIGHTED BY MINES)

Technologies	Currently use		Plan to use		No plan to use	
	%		%		%	
	Method		Method		Method	
	Selective	Bulk	Selective	Bulk	Selective	Bulk
AUTOMATED MATERIAL HANDLING						
Automatic bin level measurement	40.9	51.0	1.7	7.0	57.4	42.0
Aut. conveyor - sequential analog	28.7	39.0	2.6	3.0	68.7	58.0
- computer control	24.3	30.0	3.5	12.0	72.2	58.0
Aut. slurry pumping - stop select	35.7	29.0	5.2	6.0	59.1	65.0
- var. speeds	28.7	31.0	9.6	8.0	61.7	61.0
Aut. handling equip. - ores	26.1	29.0	7.8	6.0	66.1	65.0
- slurries	29.6	25.0	6.1	8.0	64.3	67.0
- concentrates	18.3	23.0	7.0	5.0	74.8	72.0
- reagents	21.7	23.0	11.3	8.0	67.0	69.0
Computer controlled vehicle & equipment	10.4	12.0	8.7	12.0	80.9	76.0
Comp. based vehicle & equip. maintenance	32.2	26.0	10.4	11.0	57.4	63.0
COMMUNICATIONS & NETWORKS						
Radio based voice networks - open pit	28.7	42.0	1.7	2.0	69.6	56.0
- underground	19.1	13.0	11.3	5.0	69.6	82.0
Data communication networks - open pit	6.1	15.0	2.6	6.0	91.3	79.0
Underground data communication networks	21.7	9.0	9.6	7.0	68.7	84.0
In plant data networks linking aut. processes	26.1	26.0	10.4	11.0	63.5	63.0
CONTROL						
Analog controllers	42.6	46.0	1.7	5.0	55.7	49.0
Programmable logic controllers (PLC)	48.7	54.0	7.8	9.0	43.5	37.0
On-line statistical process control	14.8	16.0	13.9	19.0	71.3	65.0
Supervisory control & data acquisition	21.7	22.0	7.8	14.0	70.4	64.0
Int. expert systems for process control	10.4	10.0	8.7	15.0	80.9	75.0
Aut. environmental monitoring & control	27.8	21.0	7.8	10.0	64.3	69.0
Automated T.V. image analysis	6.1	11.0	2.6	5.0	91.3	84.0
AUTOMATED PROCESSING SYSTEMS						
Near-stream analysis	11.3	13.0	4.3	4.0	84.3	83.0
On-stream analysis (XRF)	16.5	27.0	5.2	8.0	78.3	65.0
On-stream size analysis	10.4	7.0	5.2	8.0	84.3	85.0
Flow density measurement	39.1	43.0	8.7	7.0	52.2	50.0
Inventory measurement	23.5	23.0	5.2	8.0	71.3	69.0

TABLE 28.2 THE USE OF TECHNOLOGY BY MINING METHOD (WEIGHTED BY EMPLOYEES)

Technologies	Currently use		Plan to use		No plan to use	
	%		%		%	
	Selective	Bulk	Selective	Bulk	Selective	Bulk
AUTOMATED MATERIAL HANDLING						
Automatic bin level measurement	67.9	82.9	0.5	3.6	31.6	13.5
Aut. conveyor - sequential analog	42.8	73.0	1.7	1.5	55.6	25.5
computer control	44.5	61.6	1.7	12.3	53.8	26.1
Aut. slurry pumping - stop select	60.0	40.8	1.9	11.0	38.2	48.2
var. speeds	54.1	61.2	3.9	8.0	42.0	30.7
Aut. handling equip. - ores	54.1	62.1	8.2	4.4	37.7	33.5
slurries	62.4	53.8	2.5	9.8	35.1	36.4
concentrates	42.6	48.8	8.5	4.2	48.9	47.0
reagents	49.9	51.9	12.5	8.7	37.6	39.4
Computer controlled vehicle & equip.	25.1	36.3	14.7	7.3	60.2	56.4
Comp. based vehicle & equip. maintenance	48.5	57.4	7.5	11.4	44.1	31.2
COMMUNICATIONS & NETWORKS						
Radio based voice networks - open pit	32.6	65.8	0.1	0.6	67.2	33.6
underground	34.9	38.1	6.8	3.5	58.4	58.4
Data communication networks - open pit	10.2	41.4	4.0	6.1	85.8	52.5
Underground data communication networks	44.8	26.2	8.1	11.2	47.1	62.7
In plant data networks linking aut. proc.	54.0	59.8	13.7	15.3	32.3	24.9
CONTROL						
Analog controllers	63.8	77.1	1.0	1.7	35.3	21.1
Programmable logic controllers (PLC)	68.7	86.2	8.9	6.8	22.5	7.0
On-line statistical process control	19.2	38.0	28.9	30.3	51.9	31.7
Supervisory control & data acquisition	45.5	54.5	8.7	11.7	45.8	33.8
Int. expert systems for process control	15.9	42.4	22.2	20.4	62.0	37.1
Aut. environmental monitoring & control	51.7	57.6	7.1	12.3	41.2	30.2
Automated T.V. image analysis	10.5	27.8	0.9	5.5	88.6	66.7
AUTOMATED PROCESSING SYSTEMS						
Near-stream analysis	13.7	36.5	3.1	2.2	83.3	61.2
On-stream analysis (XRF)	38.5	59.8	10.4	7.8	51.1	32.3
On-stream size analysis	27.9	31.3	5.0	13.8	67.1	54.9
Flow density measurement	73.0	73.8	6.3	6.1	20.7	20.1
Inventory measurement	39.5	41.4	10.7	11.4	49.8	47.2

TABLE 29.1 THE USE OF TECHNOLOGY BY OWNERSHIP OF MINING OPERATION (WEIGHTED BY MINES)

	Currently use			Plan to use			No plan to use		
	%			%			%		
	owner			owner			owner		
Technologies	Canada	U.S.	Other	Canada	U.S.	Other	Canada	U.S.	Other
AUTOMATED MATERIAL HANDLING									
Automatic bin level measurement	46.6	46.2	51.6	5.6	-	6.5	47.8	53.8	41.9
Aut. conveyor - sequential analog	36.0	19.2	45.2	2.8	-	3.2	61.2	80.8	51.6
- computer control	29.8	19.2	16.1	6.7	7.7	16.1	63.5	73.1	67.7
Aut. slurry pumping - stop select	32.6	30.8	32.3	3.9	3.8	16.1	63.5	65.4	51.6
- var. speeds	30.3	19.2	35.5	8.4	7.7	16.1	61.2	73.1	48.4
Aut. handling equip. - ores	28.1	26.9	22.6	6.7	-	12.9	65.2	73.1	64.5
- slurries	27.0	26.9	25.8	7.3	-	9.7	65.7	73.1	64.5
- concentrates	21.3	26.9	16.1	6.2	-	12.9	72.5	73.1	71.0
- reagents	20.8	23.1	35.5	10.1	3.8	16.1	69.1	73.1	48.4
Computer controlled vehicle & equip	13.5	23.1	3.2	10.7	3.8	16.1	75.8	73.1	80.6
Comp. based vehicle & equip. maintenance	29.8	30.8	25.8	9.6	19.2	19.4	60.7	50.0	54.8
COMMUNICATIONS & NETWORKS									
Radio based voice networks - open pit	31.5	46.2	38.7	1.7	-	3.2	66.9	53.8	58.1
- underground	16.3	23.1	16.1	8.4	-	9.7	75.3	76.9	74.2
Data communication networks - open pit	9.0	15.4	6.5	2.8	3.8	9.7	88.2	80.8	83.9
Underground data communication networks	15.2	19.2	16.1	7.9	3.8	9.7	77.0	76.9	74.2
In plant data networks linking aut. proc.	23.6	26.9	38.7	10.1	19.2	6.5	66.3	53.8	54.8
CONTROL									
Analog controllers	46.1	46.2	38.7	4.5	-	6.5	49.4	53.8	54.8
Programmable logic controllers (PLC)	50.0	53.8	54.8	9.6	11.5	9.7	40.4	34.6	35.5
On-line statistical process control	15.7	15.4	12.9	19.1	7.7	9.7	65.2	76.9	77.4
Supervisory control & data acquisition	21.9	23.1	22.6	12.4	-	16.1	65.7	76.9	61.3
Int. expert systems for process control	9.6	7.7	22.6	9.6	15.4	19.4	80.9	76.9	58.1
Aut. environmental monitoring & control	24.7	23.1	29.0	8.4	3.8	16.1	66.9	73.1	54.8
Automated T.V. image analysis	6.2	19.2	12.9	3.4	-	9.7	90.4	80.8	77.4
AUTOMATED PROCESSING SYSTEMS									
Near-stream analysis	11.8	11.5	12.9	5.1	3.8	3.2	83.1	84.6	83.9
On-stream analysis (XRF)	21.3	23.1	25.8	7.9	3.8	3.2	70.8	73.1	71.0
On-stream size analysis	6.7	19.2	12.9	7.9	-	6.5	85.4	80.8	80.6
Flow density measurement	39.3	57.7	41.9	8.4	-	12.9	52.2	42.3	45.2
Inventory measurement	21.3	38.5	22.6	6.7	7.7	6.5	71.9	53.8	71.0

TABLE 29.2 THE USE OF TECHNOLOGY BY OWNERSHIP OF MINING OPERATION (WEIGHTED BY EMPLOYEES)

	Currently use			Plan to use			No plan to use		
	%			%			%		
	owner			owner			owner		
Technologies	Canada	U.S.	Other	Canada	U.S.	Other	Canada	U.S.	Other
AUTOMATED MATERIAL HANDLING									
Automatic bin level measurement	82.0	54.3	72.6	2.1	-	5.0	15.9	45.7	22.3
Aut. conveyor - sequential analog	61.2	38.1	70.4	1.9	-	0.3	36.9	61.9	29.3
- computer controled	61.2	22.6	46.9	8.6	2.8	5.4	30.1	74.6	47.8
Aut. slurry pumping - stop select	58.3	29.6	39.2	2.1	2.4	33.7	39.6	68.0	27.1
- var. speeds	62.0	31.9	65.8	7.6	4.1	6.3	30.4	64.0	27.9
Aut. handling equip. - ores	61.3	63.4	41.1	7.5	-	7.6	31.2	36.6	51.3
- slurries	60.7	65.6	36.4	6.9	-	5.6	32.4	34.4	58.0
- concentrates	53.5	47.3	15.8	6.8	-	8.4	39.7	52.7	75.8
- reagents	50.6	41.6	71.8	12.4	4.7	10.6	37.0	53.6	17.7
Computer controled vehicle & equip.	35.3	57.7	0.3	12.7	1.1	6.7	52.0	41.3	93.0
Comp. based vehicle & equip. maintenance	49.0	53.9	59.5	6.6	28.5	7.4	44.4	17.6	33.1
COMMUNICATIONS & NETWORKS									
Radio base voice networks - open pit	50.3	69.3	30.1	0.4	-	0.3	49.3	30.7	69.6
- underground	38.7	32.2	51.8	5.4	-	5.5	55.8	67.8	42.7
Data communication networks - open pit	25.1	28.3	12.9	5.7	1.1	2.6	69.2	70.7	84.5
Underground data communication networks	40.3	39.8	14.0	6.6	1.7	30.3	53.1	58.4	55.7
In plant data networks linking aut. proc.	57.2	35.6	77.8	10.4	45.7	0.9	32.3	18.8	21.4
CONTROL									
Analog controllers	77.9	43.3	67.1	2.0	-	5.2	20.1	56.7	27.7
Programmable logic controllers (PLC)	81.2	67.7	66.8	9.6	1.6	12.1	9.2	30.7	21.1
On-line statistical process control	30.7	36.3	18.9	30.6	10.4	28.9	38.7	53.2	52.1
Supervisory control & data aquisition	51.8	33.9	66.6	11.7	-	10.1	36.6	66.1	23.3
Int. expert systems for process control	28.6	25.8	48.2	16.8	35.9	18.3	54.6	38.4	33.6
Aut. environmental monitoring & control	59.1	31.7	64.5	6.3	20.1	14.2	34.6	48.3	21.3
Automated T.V. image analysis	16.6	41.6	8.3	3.9	-	1.4	79.5	58.4	90.2
AUTOMATED PROCESSING SYSTEMS									
Near-stream analysis	22.4	36.3	24.3	2.7	4.7	0.3	74.9	58.9	75.4
On-stream analysis (XRF)	49.5	48.2	65.4	10.4	5.7	0.3	40.1	46.1	34.3
On-stream size analysis	25.0	55.9	14.8	11.7	-	28.4	63.3	44.1	56.8
Flow density measurement	73.0	87.2	66.7	6.5	-	13.5	20.5	12.8	19.9
Inventory measurement	39.6	60.5	32.8	8.7	2.1	28.4	51.7	37.4	38.8

TABLE 30.1 THE USE OF TECHNOLOGY BY AGE OF OPERATION (WEIGHTED BY MINES)

Technologies	Currently use				
	%				
	years				
	0- 5	6-10	11-15	16-20	> 20
AUTOMATED MATERIAL HANDLING					
Automatic bin level measurement	34.2	44.8	41.2	72.2	54.1
Aut. conveyor - sequential analog	20.5	31.0	41.2	66.7	40.8
- computer control	20.5	34.5	17.6	33.3	29.6
Aut. slurry pumping - stop select	27.4	41.4	23.5	50.0	31.6
- var. speeds	24.7	37.9	29.4	44.4	28.6
Aut. handling equip. - ores	19.2	34.5	29.4	44.4	27.6
- slurries	21.9	44.8	23.5	38.9	23.5
- concentrates	13.7	20.7	29.4	22.2	25.5
- reagents	17.8	31.0	23.5	33.3	22.4
Computer controlled vehicle & equipment	5.5	24.1	17.6	16.7	14.3
Comp. based vehicle & equip. maintenance	26.0	31.0	29.4	44.4	28.6
COMMUNICATIONS & NETWORKS					
Radio based voice networks - open pit	20.5	31.0	23.5	72.2	39.8
- underground	9.6	24.1	17.6	5.6	22.4
Data communication networks - open pit	2.7	17.2	-	22.2	11.2
Underground data communication networks	12.3	27.6	17.6	-	17.3
In plant data networks linking aut. processes	16.4	34.5	29.4	38.9	27.6
CONTROL					
Analog controllers	35.6	44.8	41.2	55.6	51.0
Programmable logic controllers (PLC)	41.1	58.6	41.2	44.4	59.2
On-line statistical process control	9.6	24.1	17.6	11.1	17.3
Supervisory control & data acquisition	19.2	20.7	11.8	33.3	24.5
Int. expert systems for process control	6.8	10.3	17.6	11.1	13.3
Aut. environmental monitoring & control	20.5	27.6	29.4	22.2	27.6
Automated T.V. image analysis	5.5	3.4	11.8	5.6	12.2
AUTOMATED PROCESSING SYSTEMS					
Near-stream analysis	8.2	20.7	11.8	16.7	11.2
On-stream analysis (XRF)	13.7	20.7	17.6	38.9	26.5
On-stream size analysis	4.1	6.9	11.8	22.2	10.2
Flow density measurement	35.6	44.8	29.4	44.4	46.9
Inventory measurement	17.8	27.6	17.6	27.8	26.5

TABLE 30.2 THE USE OF TECHNOLOGY BY AGE OF OPERATION (WEIGHTED BY EMPLOYEES)

Technologies	Currently use				
	%				
	years				
	0- 5	6-10	11-15	16-20	> 20
AUTOMATED MATERIAL HANDLING					
Automatic bin level measurement	57.2	80.2	45.4	88.0	81.0
Aut. conveyor - sequential analog	40.7	44.8	50.9	88.9	61.8
- computer control	35.6	71.0	37.6	58.9	55.3
Aut. slurry pumping - stop select	48.1	75.6	41.9	88.4	44.4
- var. speeds	38.3	52.9	47.8	85.7	60.2
Aut. handling equip. - ores	37.8	60.3	60.6	69.6	61.6
- slurries	44.6	78.0	29.9	68.1	58.3
- concentrates	23.9	41.6	43.3	44.0	54.7
- reagents	33.9	35.9	54.7	58.3	57.4
Computer controlled vehicle & equipment	12.2	39.6	35.9	37.2	36.9
Comp. based vehicle & equip. maintenance	40.9	54.9	60.6	65.3	49.8
COMMUNICATIONS & NETWORKS					
Radio based voice networks - open pit	23.5	51.1	13.2	93.1	52.4
- underground	16.1	33.8	28.0	4.4	50.7
Data communication networks - open pit	3.6	35.7	-	34.7	26.3
Underground data communication networks	13.1	43.6	29.5	-	46.1
In plant data networks linking aut. proc.	33.8	67.8	44.4	66.4	59.0
CONTROL					
Analog controllers	59.1	51.0	70.9	88.1	75.7
Programmable logic controllers (PLC)	58.8	90.8	51.9	66.0	82.2
On-line statistical process control	14.0	32.9	24.0	5.9	36.3
Supervisory control & data acquisition	38.0	31.5	18.0	58.9	58.3
Int. expert systems for process control	10.4	11.1	18.1	7.7	42.0
Aut. environmental monitoring & control	40.5	50.3	51.6	42.8	62.1
Automated T.V. image analysis	9.7	2.4	30.0	15.3	23.6
AUTOMATED PROCESSING SYSTEMS					
Near-stream analysis	6.4	34.4	30.0	20.5	26.7
On-stream analysis (XRF)	20.1	34.8	35.7	53.8	61.1
On-stream size analysis	5.8	12.1	22.1	36.9	34.4
Flow density measurement	56.9	76.1	48.8	81.1	78.1
Inventory measurement	28.8	39.3	18.1	25.4	48.4

TABLE 30.3 PLAN TO USE TECHNOLOGY BY AGE OF OPERATION (WEIGHTED BY MINES)

Technologies	Plan to use				
	%				
	years				
	0- 5	6-10	11-15	16-20	> 20
AUTOMATED MATERIAL HANDLING					
Automatic bin level measurement	9.6	3.4	-	-	4.1
Aut. conveyor - sequential analog	2.7	3.4	5.9	-	2.0
- computer control	5.5	3.4	17.6	5.6	10.2
Aut. slurry pumping - stop select	5.5	6.9	5.9	-	6.1
- var. speeds	11.0	6.9	17.6	5.6	8.2
Aut. handling equip. - ores	6.8	10.3	-	5.6	7.1
- slurries	9.6	6.9	5.9	-	6.1
- concentrates	8.2	6.9	5.9	5.6	5.1
- reagents	13.7	13.8	5.9	5.6	8.2
Computer controlled vehicle & equipment	12.3	10.3	-	11.1	11.2
Comp. based vehicle & equip. maintenance	9.6	3.4	11.8	11.1	16.3
COMMUNICATIONS & NETWORKS					
Radio based voice networks - open pit	2.7	-	-	-	2.0
- underground	16.4	3.4	5.9	-	4.1
Data communication networks - open pit	2.7	3.4	-	16.7	3.1
Underground data communication networks	9.6	10.3	-	-	8.2
In plant data networks linking aut. processes	9.6	3.4	11.8	5.6	14.3
CONTROL					
Analog controllers	4.1	6.9	-	5.6	4.1
Programmable logic controllers (PLC)	8.2	10.3	11.8	16.7	9.2
On-line statistical process control	12.3	17.2	17.6	27.8	17.3
Supervisory control & data acquisition	12.3	13.8	17.6	22.2	7.1
Int. expert systems for process control	9.6	10.3	5.9	38.9	9.2
Aut. environmental monitoring & control	9.6	10.3	-	16.7	8.2
Automated T.V. image analysis	2.7	3.4	11.8	11.1	2.0
AUTOMATED PROCESSING SYSTEMS					
Near-stream analysis	5.5	10.3	11.8	-	2.0
On-stream analysis (XRF)	6.8	10.3	11.8	11.1	4.1
On-stream size analysis	4.1	10.3	11.8	11.1	6.1
Flow density measurement	4.1	10.3	23.5	11.1	7.1
Inventory measurement	2.7	10.3	5.9	11.1	8.2

TABLE 30.4 PLAN TO USE TECHNOLOGY BY AGE OF OPERATION (WEIGHTED BY EMPLOYEES)

Technologies	Plan to use				
	%				
	years				
	0- 5	6-10	11-15	16-20	> 20
AUTOMATED MATERIAL HANDLING					
Automatic bin level measurement	12.0	0.5	-	-	1.0
Aut. conveyor - sequential analog	2.3	3.3	8.9	-	0.6
- computer control	13.9	0.5	11.4	0.8	7.9
Aut. slurry pumping - stop select	7.9	2.6	1.7	-	7.4
- var. speeds	16.2	2.6	11.0	4.4	5.9
Aut. handling equip. - ores	14.8	7.3	-	0.8	5.8
- slurries	17.4	3.3	1.7	-	5.0
- concentrates	15.0	3.3	1.7	5.6	5.1
- reagents	22.8	29.5	1.7	5.6	6.9
Computer controlled vehicle & equipment	15.9	6.4	-	6.4	11.1
Comp. based vehicle & equip. maintenance	7.2	0.5	2.5	2.3	13.3
COMMUNICATIONS & NETWORKS					
Radio based voice networks - open pit	1.8	-	-	-	0.1
- underground	27.5	0.5	5.7	-	1.4
Data communication networks - open pit	3.3	0.5	-	39.5	1.2
Underground data communication networks	15.4	4.0	-	-	10.2
In plant data networks linking aut. proc.	17.3	0.5	8.0	0.8	18.0
CONTROL					
Analog controllers	4.7	5.4	-	0.5	1.4
Programmable logic controllers (PLC)	16.4	5.9	21.3	20.2	5.4
On-line statistical process control	21.8	25.9	2.7	39.9	29.1
Supervisory control & data acquisition	17.3	5.8	22.5	28.5	5.7
Int. expert systems for process control	16.9	10.5	0.9	54.1	18.3
Aut. environmental monitoring & control	14.0	10.5	-	15.2	7.8
Automated T.V. image analysis	3.0	2.7	2.1	21.8	0.6
AUTOMATED PROCESSING SYSTEMS					
Near-stream analysis	8.2	7.8	1.9	-	1.1
On-stream analysis (XRF)	12.3	23.3	8.4	32.9	1.8
On-stream size analysis	6.8	11.0	13.6	20.3	12.3
Flow density measurement	5.1	5.4	28.0	10.0	5.0
Inventory measurement	2.2	2.9	1.5	15.8	13.0

TABLE 30.5 NO PLAN TO USE TECHNOLOGY BY AGE OF OPERATION (WEIGHTED BY MINES)

Technologies	No plan to use				
	%				
	years				
	0- 5	6-10	11-15	16-20	> 20
AUTOMATED MATERIAL HANDLING					
Automatic bin level measurement	56.2	51.7	58.8	27.8	41.8
Aut. conveyor - sequential analog	76.7	65.5	52.9	33.3	57.1
- computer control	74.0	62.1	64.7	61.1	60.2
Aut. slurry pumping - stop select	67.1	51.7	70.6	50.0	62.2
- var. speeds	64.4	55.2	52.9	50.0	63.3
Aut. handling equip. - ores	74.0	55.2	70.6	50.0	65.3
- slurries	68.5	48.3	70.6	61.1	70.4
- concentrates	78.1	72.4	64.7	72.2	69.4
- reagents	68.5	55.2	70.6	61.1	69.4
Computer controlled vehicle & equipment	82.2	65.5	82.4	72.2	74.5
Comp. based vehicle & equip. maintenance	64.4	65.5	58.8	44.4	55.1
COMMUNICATIONS & NETWORKS					
Radio based voice networks - open pit	76.7	69.0	76.5	27.8	58.2
- underground	74.0	72.4	76.5	94.4	73.5
Data communication networks - open pit	94.5	79.3	100.0	61.1	85.7
Underground data communication networks	78.1	62.1	82.4	100.0	74.5
In plant data networks linking aut. processes	74.0	62.1	58.8	55.6	58.2
CONTROL					
Analog controllers	60.3	48.3	58.8	38.9	44.9
Programmable logic controllers (PLC)	50.7	31.0	47.1	38.9	31.6
On-line statistical process control	78.1	58.6	64.7	61.1	65.3
Supervisory control & data acquisition	68.5	65.5	70.6	44.4	68.4
Int. expert systems for process control	83.6	79.3	76.5	50.0	77.6
Aut. environmental monitoring & control	69.9	62.1	70.6	61.1	64.3
Automated T.V. image analysis	91.8	93.1	76.5	83.3	85.7
AUTOMATED PROCESSING SYSTEMS					
Near-stream analysis	86.3	69.0	76.5	83.3	86.7
On-stream analysis (XRF)	79.5	69.0	70.6	50.0	69.4
On-stream size analysis	91.8	82.8	76.5	66.7	83.7
Flow density measurement	60.3	44.8	47.1	44.4	45.9
Inventory measurement	79.5	62.1	76.5	61.1	65.3

TABLE 30.6 NO PLAN TO USE TECHNOLOGY BY AGE OF OPERATION (WEIGHTED BY EMPLOYEES)

Technologies	No plan to use				
	%				
	years				
	0- 5	6-10	11-15	16-20	> 20
AUTOMATED MATERIAL HANDLING					
Automatic bin level measurement	30.8	19.3	54.6	12.0	18.0
Aut. conveyor - sequential analog	57.1	51.8	40.2	11.1	37.6
- computer control	50.5	28.6	51.0	40.3	36.7
Aut. slurry pumping - stop select	43.9	21.8	56.5	11.6	48.2
- var. speeds	45.6	44.4	41.3	9.9	33.8
Aut. handling equip. - ores	47.4	32.4	39.4	29.6	32.5
- slurries	38.0	18.7	68.4	31.9	36.8
- concentrates	61.1	55.1	55.0	50.4	40.2
- reagents	43.4	34.7	43.6	36.1	35.6
Computer controlled vehicle & equipment	72.0	53.9	64.1	56.3	52.0
Comp. based vehicle & equip. maintenance	51.9	44.6	36.9	32.4	36.9
COMMUNICATIONS & NETWORKS					
Radio based voice networks - open pit	74.7	48.9	86.8	6.9	47.4
- underground	56.4	65.7	66.3	95.6	48.0
Data communication networks - open pit	93.1	63.7	100.0	25.9	72.5
Underground data communication networks	71.5	52.4	70.5	100.0	43.7
In plant data networks linking aut. proc.	48.9	31.7	47.6	32.8	22.9
CONTROL					
Analog controllers	36.2	43.6	29.1	11.4	22.9
Programmable logic controllers (PLC)	24.8	3.4	26.8	13.8	12.3
On-line statistical process control	64.2	41.2	73.2	54.2	34.6
Supervisory control & data acquisition	44.7	62.7	59.4	12.6	36.0
Int. expert systems for process control	72.7	78.4	81.1	38.1	39.7
Aut. environmental monitoring & control	45.4	39.1	48.4	41.9	30.1
Automated T.V. image analysis	87.3	94.9	67.9	62.9	75.8
AUTOMATED PROCESSING SYSTEMS					
Near-stream analysis	85.5	57.8	68.1	79.5	72.2
On-stream analysis (XRF)	67.6	42.0	55.9	13.3	37.0
On-stream size analysis	87.5	77.0	64.3	42.9	53.3
Flow density measurement	38.0	18.6	23.2	8.9	16.9
Inventory measurement	69.0	57.8	80.5	58.8	38.6

TABLE 31.1 IMPACT ON OUTPUT

	no.	%
OUTPUT		
Increase	109	63.4
Decrease	-	-
No Change	63	36.6
ALL	172	100.0

TABLE 31.2 IMPACT ON PRODUCT QUALITY

	no.	%
QUALITY		
Increase	97	56.1
Decrease	1	0.6
No Change	75	43.4
ALL	173	100.0

TABLE 31.3 IMPACT ON COSTS

	no.	%
COSTS		
Increase	15	8.9
Decrease	109	64.5
No Change	45	26.6
ALL	169	100.0

TABLE 31.4 IMPACT ON OUTPUT BY INDUSTRY

	OUTPUT					
	Increase		Decrease		No Change	
	no.	%	no.	%	no.	%
Gold Mines	33	57.9	-	-	24	42.1
Copper and Copper-Zinc Mines	16	88.9	-	-	2	11.1
Nickel-Copper Mines	3	60.0	-	-	2	40.0
Silver-Lead-Zinc Mines	7	87.5	-	-	1	12.5
Uranium Mines	4	57.1	-	-	3	42.9
Iron Mines	8	100.0	-	-	-	-
Other Metal Mines	4	100.0	-	-	-	-
Asbestos Mines	1	33.3	-	-	2	66.7
Gypsum Mines	6	60.0	-	-	4	40.0
Potash Mines	7	70.0	-	-	3	30.0
Salt Mines	6	54.5	-	-	5	45.5
Other Non-Metal Mines (except coal)	6	37.5	-	-	10	62.5
Coal Mines	8	53.3	-	-	7	46.7
ALL	109	63.4	-	-	63	36.6

TABLE 31.5 IMPACT ON PRODUCT QUALITY BY INDUSTRY

	PRODUCT QUALITY					
	Increase		Decrease		No Change	
	no.	%	no.	%	no.	%
Gold Mines	22	37.9	1	1.7	35	60.3
Copper and Copper-Zinc Mines	14	77.8	-	-	4	22.2
Nickel-Copper Mines	5	100.0	-	-	-	-
Silver-Lead-Zinc Mines	6	75.0	-	-	2	25.0
Uranium Mines	5	71.4	-	-	2	28.6
Iron Mines	8	100.0	-	-	-	-
Other Metal Mines	3	75.0	-	-	1	25.0
Asbestos Mines	2	66.7	-	-	1	33.3
Gypsum Mines	5	50.0	-	-	5	50.0
Potash Mines	6	60.0	-	-	4	40.0
Salt Mines	6	54.5	-	-	5	45.5
Other Non-Metal Mines (except coal)	6	37.5	-	-	10	62.5
Coal Mines	9	60.0	-	-	6	40.0
ALL	97	56.1	1	0.6	75	43.4

TABLE 31.6 IMPACT ON COSTS BY INDUSTRY

	COSTS					
	Increase		Decrease		No Change	
	no.	%	no.	%	no.	%
Gold Mines	6	10.9	28	50.9	21	38.2
Copper and Copper-Zinc Mines	1	5.8	15	88.2	1	5.9
Nickel-Copper Mines	-	-	4	80.0	1	20.0
Silver-Lead-Zinc Mines	-	-	8	100.0	-	-
Uranium Mines	-	-	6	85.7	1	14.3
Iron Mines	-	-	8	100.0	-	-
Other Metal Mines	-	-	2	50.0	2	50.0
Asbestos Mines	-	-	3	100.0	-	-
Gypsum Mines	2	22.2	6	66.7	1	11.1
Potash Mines	-	-	9	81.8	2	18.2
Salt Mines	-	-	6	54.6	5	45.5
Other Non-Metal Mines (except coal)	3	18.8	6	37.5	7	43.8
Coal Mines	3	20.0	8	53.3	4	26.7
ALL	15	8.9	109	64.5	45	26.6

TABLE 31.7 IMPACT ON OUTPUT BY SIZE OF MINE

	OUTPUT					
	Increase		Decrease		No Change	
	no.	%	no.	%	no.	%
EMPLOYEES						
0 - 49	13	46.4	-	-	15	53.6
50-249	43	60.6	-	-	28	39.4
> 249	53	72.6	-	-	20	27.4
ALL	109	63.4	-	-	63	36.6

TABLE 31.8 IMPACT ON QUALITY BY SIZE OF MINE

	QUALITY					
	Increase		Decrease		No Change	
	no.	%	no.	%	no.	%
EMPLOYEES						
0 - 49	15	51.7	-	-	14	48.2
50-249	31	43.7	1	1.4	39	54.9
> 249	51	69.9	-	-	22	30.1
ALL	97	56.1	1	0.6	75	43.4

TABLE 31.9 IMPACT ON COSTS BY SIZE OF MINE

	COSTS					
	Increase		Decrease		No Change	
	no.	%	no.	%	no.	%
EMPLOYEES						
0 - 49	5	18.5	11	40.7	11	40.7
50-249	8	11.6	39	56.5	22	31.9
> 249	2	2.7	59	80.8	12	16.4
ALL	15	8.9	109	64.5	45	26.6

Distribution Tables

TABLE 32.1 DISTRIBUTION BY INDUSTRY

Industries	no.	%
Gold Mines	74	31.5
Copper and Copper-Zinc Mines	22	9.4
Nickel-Copper Mines	5	2.1
Silver-Lead-Zinc Mines	16	6.8
Uranium Mines	9	3.8
Iron Mines	8	3.4
Other Metal Mines	8	3.4
Asbestos Mines	4	1.7
Gypsum Mines	15	6.4
Potash Mines	11	4.7
Salt Mines	11	4.7
Other Non-Metal Mines (except coal)	33	14.0
Coal Mines	19	8.1
ALL	235	100.0

TABLE 32.2 DISTRIBUTION BY PROVINCE

Province	no.	%
Newfoundland	10	4.3
Nova Scotia	14	6.0
New Brunswick	8	3.4
Quebec	58	24.7
Ontario	53	22.6
Manitoba	8	3.4
Saskatchewan	25	10.6
Alberta	8	3.4
British Columbia	39	16.6
Yukon	4	1.7
Northwest Territories	8	3.4
CANADA	235	100.0

TABLE 32.3 DISTRIBUTION BY MINING METHOD

Mining Method	no.	%
Selective	115	53.5
Bulk	100	46.5
ALL	215	100.0

TABLE 32.4 DISTRIBUTION BY OWNERSHIP

Owner	no.	%
Canada	178	75.7
U.S.	26	11.1
Other	31	13.2
CANADA	235	100.0

TABLE 32.5 DISTRIBUTION BY SIZE OF OPERATION

Number of employees	no.	%
0 - 49	67	28.5
50 - 249	86	36.6
250 +	82	34.9
CANADA	235	100.0

TABLE 32.6 DISTRIBUTION BY AGE OF OPERATION

Age of Operation	no.	%
0- 5	73	31.1
6-10	29	12.3
11-15	17	7.2
16-20	18	7.7
> 20	98	41.7
CANADA	235	100.0

TABLE 33.1 QUESTIONNAIRES SENT

	no.
QUESTIONNAIRES SENT	324
Inactive or ceased operation	48
Exploration only	22
In early stage of development	8
Non-response	11
USABLE QUESTIONNAIRES	235