



MAJOR SMELTING PLANT

Solution: Avert Labor Unrest, Reduce Rework and Waste, and Improve Worker Safety and Performance

Averted strike and resolved labor/management impasse over shift schedule structure, while achieving 24% reduction in scrap and rework, 33% reduction in toxic exposure, and 6% overall plant productivity increase.

For a number of years after a labor strike over working conditions and shift schedules in one of their world's largest smelting plants site, management and the union leadership continued to debate the merits of changing work schedules to incorporate 12 hour shifts. An increased use of 12 hour schedules in the local paper mills and at other company facilities encouraged workers to keep lobbying for such a change to obtain more days and weekends off.

The company was reluctant to concede to these demands because of very real concerns about potentially adverse health effects resulting from the increased hours of consecutive exposure to airborne carcinogens in the smelter, which employed over 6000 people. A schedule with 12 hour shifts would intuitively increase the daily hours of exposure by 50%, which would have exceeded Federal threshold limits. It thus seemed to logically follow that such an increased exposure would surely increase long term health risks, and impose Government sanctions on the company.

A compromise solution was devised which utilized a combination of 8 and 12 hour shifts, whereby the employees would only work 12 hour shifts on the weekends, with only four of these shifts required in a 28-day period.

However, due to the absence of solid, objective data which clearly measured and defined the relative health risks of 8 vs. 12 hour shifts at the smelter, there was no basis upon which to make a permanent

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decision either way. It was finally decided that the company would seek an independent, objective re-evaluation of this complex and highly volatile issue by utilizing a 3rd party, subject matter expert.

Circadian Technologies, Inc. (CTI) was subsequently retained jointly by the Aluminum Company and the Federation of unions representing the aluminum workers (La Federation des Syndicats du Secteur Aluminum, Inc.- FSSA). Our commission was to evaluate a proposed shift schedule change at the smelter, which was to consist of all 12 hour shifts and be the focal point of forthcoming union-management contract negotiations. CTI's mission was to provide definitive information for both parties, regarding the potential impact of the straight 12 hour schedule on shiftworker health and performance.

The adverse health consequences of round-the-clock shift schedules derive from the incompatibility of the schedule with normal, human biological functions controlled by the body's biological clock. Schedules that desynchronize the body's internal timing mechanism produce chronic fatigue, sleep loss, and, eventually, a variety of stress-related illnesses. As part of this analysis, CTI assessed the "biocompatibility" of the old 8 hour schedule and that of a straight 12 hour shift schedule, in terms of relative impact on stress, fatigue, and performance.

Shift schedules for workers in an aluminum smelter can have an additional potential effect on health by altering the pattern of environmental toxins associated with the smelting process. Although the total number of hours worked under each schedule was essentially the same, the schedule required different periods of sustained continuous exposure, different "acute relief" periods (hours between shift) and "chronic relief" periods (days off). In addition, any change in shift schedule can produce an alteration in work pattern within the shift, producing a greater or lesser exposure per hour worked.

The pre-established link between the aluminum smelting process and respiratory and bladder neoplasms had resulted in a sustained effort to limit the level of toxic exposure on the job. Nevertheless, in some areas of the smelter, workers were exposed to levels of cancer-associated

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toxins which were at or near the regulated limit for exposure over an 8 hour shift. As a consequence, both management and the union were very concerned about any potential change in toxin exposure levels emanating from a change in shift schedule, notwithstanding the fact that the employees expressed a strong preference for the 12 hour shifts.

The company maintained an extensive industrial hygiene department at the smelting plant, charged with monitoring toxic exposure and ensuring compliance with Canadian regulations. Although extensive test data on toxic exposure levels was available, the existing data did not address the difference between 8 and 12-hour shifts. Therefore, as a corollary to the schedule analysis, CTI undertook a new study of work patterns and toxic exposure for both 8 and 12 hour shifts.

A scientific advisory panel of experts in biostatistics, occupational health, carcinogenesis research, and ergonomics was convened at Harvard University to develop the appropriate scientific methodology, evaluate the collected data, and determine whether the straight 12-hour schedule significantly affected toxic risk.

The project involved several parallel processes of on-site data gathering and joint committee review, extensive communications, employee involvement and participation, site-wide surveys, and a series of educational briefings for management, union, and shift worker representatives. Collaborative decisions were made based on statistical analysis of the data and extensive discussions as the project unfolded, and the results were achieved (under tremendous time pressure) in time for the contract negotiations. As an added caveat, all of the surveys, communications, and information were presented in both French and English. CTI also enjoyed the unique opportunity to serve both management and the union towards achieving a win-win solution to this long festering issue.

The overall results dispelled many myths, concerns, and issues to help facilitate a major breakthrough in labor management relations, as well as further ensure the health, safety, and productivity of the world's largest smelting operation. Extensive "time on task" analyses actually

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revealed a substantial reduction in toxic exposures with the straight 12 hour shifts.

As it turned out, most of the toxic exposure was occurring intermittently during the trimming and crust breaking tasks which occurred primarily during shift transitions. Since the 12 hour shifts required only two transitions per day versus the 8-hour shifts, and since fewer shifts were worked with the 12 hour schedule... a substantial reduction in toxic exposure was achieved. Moreover, the total amount of task time spent in the areas of exposure was considerably less on a time weighted basis with the 12 hour schedules as compared to the 8 hour shifts, enabling less carcinogen build up in the worker's bodies, and more frequent expulsion.

Based on subjective and objective analysis of the "biocompatibility" of the different schedules, it was determined that the 8 hour schedules and combination 8 and 12 hour schedules were more fatiguing, and that their inherently rapid rotations and absence of long breaks created considerable difficulty in shiftworker adjustment to the shift transitions. Straight 12 hour shifts with slower rotation and longer breaks were found to be more compatible with the body's circadian timing system, thus improving sleep quality, alertness, and worker satisfaction.

Overall, there was no evidence that suggested any negative effects on human performance or greater incidence of human error with the 12 hour shifts. In fact, there was a 5-6% productivity increase resulting from reduced scrap and rework with the 12 hour shifts. Moreover, the addition of the longer breaks (days off) inherent in the 12 hour shift schedules enhanced the toxic elimination process of the body to help reduce cumulative build-up.