European Foundation
for the Improvement of
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COMPRESSED WORKING TIME

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Chapter 1: INTRODUCTION

Rationale

Compressed working weeks are not a sudden new phenomenon. In various forms, they have been around since the 1970s and 1980s. But they present opportunities and difficulties that continue to make them controversial.

The opportunities are, on the employee side, an amazing advance into the "leisure society".

By concentrating work into fewer work-days, extended work-breaks arrive more frequently and with greater length. In one five-crew continuous 12-hour shift system, described in chapter 3, 16-day breaks occur six times a year; between these times, there are four days off for every four days worked. In another one, apart from the holiday season, four days are worked followed by six days off. This is not quite the six-day weekend, but does generate 60% of days as work-free.

The difficulty is that this time-off is only achieved by concentrated periods of work: four consecutive 12-hour days leave little time for any activity other than simple body maintenance; four 12-hour nights are also frequently all-absorbing, and can leave a residue of fatigue that runs over into days off. All shiftworkers agree that the first day off after night shifts is a "wasted day", spent recovering from night shift.

Opportunities and difficulties for employers also exist, and are covered throughout this issue.

Principles

For trade unions, memories of the fight for an 8-hour day and the 5-day week in the early 1900s are still powerful. In principle, some unions still object to anything longer than 8 hours as a working day. In Italy, this view seems to be dominant; in the Netherlands, unions appear to be more flexible, and to press for the compressed working week as a way of reducing work hours, where they meet resistance from employers. Similar issues of principle surround the idea of working more than 5 consecutive days a week, a form of "compressed" working described in Chapter 5.

It should also be noted that in some countries there are legal restrictions on hours of work that rule out some variations. For example, in the Netherlands 12-hour shifts are not generally permitted, except in offshore situations and on Sundays in fully continuous shift systems, according to Jansen.

Enough time has elapsed for the operation of compressed working time to have been subject to considerable research, but the results of this are not always clear or consistent. The cautious conclusion is bound to be that "it all depends" on the type of work, the cost of error, and any balancing advantages. Some pointers to critical success factors are given in chapter 7.

Taken overall, it seems timely to devote an edition of BEST to compressed working hours, in its various forms, calling, as usual, on the experience of the BEST network, and its members' experience of several different European economies.

Definitions

1 *"Any system of fixed working hours more than 8 hours in length which results in a work week of less than 5 full days of work a week"* (Tepas, 1985, p.148).

This standard definition includes the most obvious examples with 9, 10 or 12 hours a day, and a normal full-time working week of 36 to 42 hours. Twelve-hour shifts are particularly controversial, and are considered in Chapter 3. Nine- or ten-hour shifts are quite common and are looked at in Chapter 2.

However, the principles of compression can also be applied to part-time work, as Knauth and Hornberger (1994) observe. This generates a second definition:

2. *Extended daily working time of part-timers, i.e. more than 8 hours per day for part-time workers.*

Part-time work is increasingly common in all developed countries, as BEST 8 reported. So extended days in part-time work are reported in Chapter 4.

3. *An unusual number of consecutive working days, i.e. more than 7 consecutive days.*

It is also worth looking at systems where there is a run of more than 5 consecutive days in the working week, where (even if the working shift is 8 hours or less) a similar consequence of extended periods of time off results. Over a given reference period they are equivalent to something like an 8-hour day for 5 days a week. This can be either for seasonal reasons, or, in an open-ended way, due to other fluctuations in demand of a cyclical nature.

4. *Service away from home.*

Some jobs away from home involve concentrated work periods. The best known examples occur in the oil industry, merchant shipping and for airline pilots and cabin crew. This is dealt with in Chapter 6.

Cultural restrictions

Costa (1994) reports that "examples of compressed working hours are practically negligible in Italy". Where they occur, they "concern only small groups of workers, with particular kinds of job and in very selective situations". Collective agreements tend to specify hours per year, week and day, and days per week, as Table 1.1 shows.

It is noticeable that in none of the work sectors listed in Table 1.1 is there provision for a working week of more than 6 days, with 5 being much more common, or for a week of 40 hours or more, or for a day of more than 8 hours. "Organizational aspects of everyday life make it difficult to extend daily working hours without severe interference with social integration and family life." "… Most workers live in proximity to their work places, so there is no strong need to reduce the number of journeys during the week to compensate for long commuting times" (Costa, 1994).

Table 1.1: Contractual working hours in various industries in Italy

Work sector	hours per year	hours per week	hours per day	days per week
Post	1559	35	6-7	6-5
Local Authorities	1603	36	6-7.2	5-6
Health	1603	36	7.2	5-6
Newspapers	1649	36	6	6
Insurance	1655	37	7.4	5
Bank	1692	37.5	7.5	5-6
Large distribution	1723	38	8	5
Gas-electricity	1738	38	7.6	5
Railway	1755	38	6.6	6
Telephone	1707	38.3	7.6	5
Tourism	1746	38.5	6.6-8	5-6
Food	1737	38.5	8	5
Mechanical	1757	38.5	8	5
Commerce	1762	38.5	6.5	6
Graphic	1742	38.6	6.6-8	5-6
Paper	1749	38.6	6.6-8	5-6
Transports	1749	38.6	8	5
Chemical	1759	38.6	8	5
Wood	1765	38.6	8	5
Textile	1773	38.8	8	5
Rubber-Plastics	1777	38.9	8	5
Radio-TV	1745	39	7.8	5
Agriculture	1773	39	6.5	6
Building	1784	39	6.6-8	5-6
Cleaners	1749	39.1	8	5

Variety and flexibility

In recent years, as Hoekstra, Jansen & Van Goudoever (1994) report for the Netherlands, “there has been increasing variety in working patterns. The compressed working week is one of the many possible arrangements for working hours. This increasing variety can be attributed to the desire for greater flexibility in working hours.

For employers this desire is a result of considerations of competitiveness: greater flexibility in working hours means that labour supply can be adjusted to demand. Employees appreciate a degree of flexibility, or at least they do so when different working times (and leisure times) fit in better with their private circumstances.

In the Netherlands, interest in the compressed working week stems from the early 1980s. The reduction of the working week from 40 to 38 or 36 hours a week put operating time under pressure in many companies (the 'collective' Friday afternoon off). For reasons of competition, employers have frequently opted to increase operating time. The compressed working week has made it possible to reduce working hours and increase operating time.

In 1984, the metal company Flexovit was the first in the Netherlands to introduce a working week consisting of four 9-hour days (operating time: five 9-hour days). At the end of the 1980s, an estimated fifty companies were working with a compressed working week (De Lange, 1989). Hundreds of 'introductions' are currently in progress, at a departmental level.

In recent years, experiments have been carried out in several large organizations. The examples we refer to are the Ministry of Transport, Public Works and Water Management and Schiphol Airport. Recent interest in the compressed working week has come principally from the (business) service sector. For example, Koninklijke Bijenkorf Beheer (KBB) signed an agreement with the unions to introduce a system of compressed working hours.

Claims : a check-list

Tepas (1985, p. 158) has listed the potential advantages and disadvantages of the compressed workweek:

Table 1.2 : Potential advantages of the compressed workweek

Increased possibility for multi-day off-the-job leisure and care activity
A reduction in commuting problems and costs
Fewer workdays with no loss of pay
A regular, steady workweek
Ease in covering all jobs at the required times
More time for scheduling meetings or training sessions
Increased opportunity for communication within the organization
Increased opportunity for communication with other organizations
Decrease in start-up and/or warm-up expenses
Fewer supervisory personnel may be needed
More efficient stock flow for assembly-line operations
Less night work
Increased production rates
Improvement in the quantity or quality of services to the public
Better opportunities to hire skilled workers in tight labour markets

Table 1.3 : Potential disadvantages of the compressed workweek

Decrements in job performance due to 'moonlighting'
Increased commuting costs
Overtime pay required by law
More fatigued workers
Little recognition of employees' individual differences
Increases in tardiness rates
Increases in absenteeism rates
Increases in employee turnover
Increases in on-the-job and off-the-job accidents
Decreases in production rates
Increased exposure to toxic substances and/or physical hazards
Scheduling problems if organizational operations are longer than the workweek
Difficulty in scheduling child care and family life during the workweek
Contrary to traditional objectives of labour unions
Increased energy and physical maintenance costs

Tepas introduces this as "a consensus of the factors usually cited" and recommends it "as a checklist or guide to the host of variables which should be considered", rather than as the definitive conclusion of research. It is a useful pointer to the type and range of factors that can be involved.

Long hours with no compensation

This issue does not deal with extended work weeks, resulting from excessive use of overtime. This is not to say that long working hours that continue without balanced breaks do not exist – simply that they do not count as "compressed working time".

Chapter 2: NINE, TEN AND ELEVEN HOUR SYSTEMS

Introduction

Compressed working weeks probably originated with 10-hour shift systems.

In the United Kingdom, the change in the standard working week in engineering and motor vehicles from 42 hours to 40 led to a strike by employees against the advice of their trade union, because they wanted 4 x 10-hour shifts on night shift, and not the $4^1/_2$ shifts preferred by their union. The earliest important reference to compressed working time was probably a book called *4 days, 40 hours*, which came out over 25 years ago (Poor, 1970).

Examples

Germany

"Some German companies have extended daily operational time by introducing daily shifts which are longer than 8 hours. As the agreed weekly working hours in general have been reduced significantly in recent years (e.g. to 35 hours in the metal industry) the introduction of 9-hour shifts means 4 working days per week for each worker" (Knauth & Hornberger, 1994).

Tables 2.1 to 2.5 show shift systems with a daily working time between 9h 5min and 9h 45 min.

The two-shift system A was introduced in the automobile industry in 1990 (Table 2.1). Although the time of attendance at the place of work is 9 hours and 30 minutes, the net working time is 8 hours 11 minutes because of several breaks. As Saturday afternoon is very important for leisure activities, the unions did not accept a Saturday evening shift. Average working time, including a few additional shifts per year, is 36 hours a week.

Table 2.1: 2-shift system A in the automobile industry, BMW Regensburg

Week	Mo	Tu	We	Th	Fr	Sa	Su
1	M	M	M	M			
2			E	E	E		
3	E	E			M	M	

Key:

M = morning shift (0500 – 1430) 9h 30min
E = evening shift (1430 – 2400) 9h 30min

Source: Bihl et al. (1993)

In the electronic industry, the employers and unions of one company agreed on the compromise shown in Table 2.2, i.e. the two shifts on Saturday were reduced to ensure that, even after the evening shift on Saturday, workers could participate in social activities. In this company shift workers were paid as if they worked 38 hours, although the average working time was only 33.42 hours per week.

The shift system shown in Table 2.3 is also called a '10:4-system' because 10 teams cover 4 working places. The one-day-off per week is rotated from Monday to Friday on a regular basis. There are thus two long free weekends from Friday to Monday (weeks 5/6 and weeks 10/1).

Table 2.2 : 2-shift system in the electronic industry

Average working time: 33.42 hours/week. Paid working time: 38 hours/week.

Week	Mo	Tu	We	Th	Fr	Sa	Su
1	M1	M1	M1	M1			
2			E1	E1	E2	E2	
3	E1	E2			M1	M2	

Key:

M1 = morning shift (0500 – 1445) 9h 45min
M2 = morning shift (0500 – 1245) 7h 45min
E1 = evening shift (1430 – 2330) 9h 0min
E2 = evening shift (1230 – 1945) 7h 25min

Source: Kutscher 1994

Table 2.3 : 2-shift system B in the automobile industry, BMW Munich

Average working time, including 9 additional shifts per year = 36 hours/week

Week	Mo	Tu	We	Th	Fr	Sa	Su
1		M	M	M	M		
2	E		E	E	E		
3	M	M		M	M		
4	E	E	E		E		
5	M	M	M	M			
6		E	E	E	E		
7	M		M	M	M		
8	E	E		E	E		
9	M	M	M		M		
10	E	E	E	E			

Key:

M = Morning shift (0550 – 1455) 9h 5min
E = Evening shift (1455 – 2400) 9h 5 min

Source: Kutscher (1994)

As consumer demand varies over the year, the company has developed two alternative shift systems (Tables 2.4 and 2.5) both for months with a higher and a lower consumer demand.

A company in the electronic industry wanted to increase operational time from 40 to about 60 hours per week. The female workers proposed a shift system with a daily working time of 10.0 to 8.5 hours as shown in Table 2.6. Three teams cover two workplaces, putting in either 10 hours or 8.5 hours each per day, from Monday to Saturday. The average weekly working time was 39.0 hours" (Knauth & Hornberger, 1994).

Table 2.4 : Alternative shift system to 2-shift system B in months with high consumer demand

Week	Mo	Tu	We	Th	Fr	Sa	Su
1		M	M	M	M	M*	
2	E		E	E	E		
3	M	M		M	M	M*	
4	E	E	E		E		
5	M	M	M	M			
6		E	E	E	E		
7	M		M	M	M	M*	
8	E	E		E	E		
9	M	M	M		M	M*	
10	E	E	E	E			

Key:

M = Morning shift (0550 – 1455) 9h 5min
M* = Additional morning shift
E = Evening shift (1455 – 2400) 9h 5 min

Source: Kutscher (1994)

Table 2.5 : Alternative shift system to 2-shift system B in months with low consumer demand

Week	Mo	Tu	We	Th	Fr	Sa	Su
1		M	M	M	M		
2	E		E	E	X		
3	M	M		M	M		
4	E	E	E		X		
5	M	M	M	M			
6		E	E	E	X		
7	M		M	M	M		
8	E	E		E	X		
9	M	M	M		M		
10	E	E	E	E			

Key:

M = Morning shift (0550 – 1455) 9h 5min
E = Evening shift (1455 – 2400) 9h 5 min
X = additional day off

Source: Kutscher (1994)

Table 2.6 : 8.5 and 10 hour shifts in the German electronic industry

Week	Mo	Tu	We	Th	Fr	Sa	Su
1	D1		D1	D1		D2	
2		D1	D1		D1	D1	
3	D1	D1		D1	D2		

Key:

D1 = day work 10h
D2 = day work 8.5h

Italy

Costa (1994) reports on variable shift lengths in air traffic control centres in Italy.

Most of the air traffic control centres have adopted a very rapidly-rotating shift system with daily rotation (1 Afternoon – 1 Morning – 1 Night), followed by 2 days-off, in order to cause less disturbance to the normal circadian rhythm of body functions, including performance. The night shift is followed by two rest days, to minimise sleep deficit and fatigue and allow an immediate recovery of lost sleep. Moreover, there is an adjustment of the length of the shifts according to the workload: 6 hours on the busiest morning shift (from 0700 to 1300), 7 hours on afternoon shift (from 1300 to 2000) and 11 hours on night shift (from 2000 to 0700). During the night shift, the controllers are entitled to a rest break of 2-3 hours during which they can sleep in rest rooms next to the control room.

"As many of them are long-distance commuters and have to spend about two hours travelling from home to work, they prefer in some cases to concentrate morning and night shifts on the same day to reduce journeys and have a longer rest period. In fact, the 6-day shift cycle changes from scheme A to scheme B (Table 2.7), having 3 work shifts concentrated in 42 hours (instead of 66 hours), thus allowing three complete rest days, instead of two, before the beginning of the following cycle. The controllers greatly appreciate this opportunity as it gives them extra time for leisure and social activities."

Table 2.7 : Different shift schemes adopted by air traffic controllers in Italy

	Scheme A	**Scheme B**
1st day	Afternoon (1300-2000)	Afternoon (1300-2000)
2nd day	Morning (0700-1300)	Morning (0700-1300) and Night (2000-0700)
3rd day	Night (2000-0700)	(Night ends at 0700)
4th day	(Night ends at 0700)	Rest
5th day	Rest	Rest
5th day	Rest	Rest

France

Fixed nightshifts of between 9 and 12 hours

Gadbois (1994) reports that extended permanent night shifts are relatively common in the health sector in France. “These work schedules are frequent in French hospitals, where nightwork is generally done on fixed shifts. In a 1981 study of 61 hospitals throughout France (Gadbois, 1981), we observed that the length of the nightshift was:

– 9 hours in 20% of hospitals,
– 10 hours in 34%,
– 11 hours in 20%,
– 12 hours in 6%, and
– 8 hours in only 20%.”

The full distribution is given in Figure 2.1.

Figure 2.1 : Distribution of shifts of different lengths in French hospitals

With fixed nightshift schedules, shifts of 10 or 11 hours implied that the full working week (generally 39 hours at that time) was completed in 3.5 or 4 days. In some cases, the schedules corresponded to highly compressed workweeks, e.g. seven consecutive 12-hour nightshifts alternating with seven nights off; seven consecutive 10-hour nightshifts alternating with seven nights off; four consecutive 10-hour nightshifts alternating with four nights off; three consecutive 12-hour nightshifts alternating with three nights off. Since then, the use of long nightshifts has increased. Upon acceptance of a standard 35-hour week for hospital nightwork, for instance, all Parisian public hospitals adopted fixed nightshifts of 10 hours, resulting in a 3.5-day workweek.

Semi-continuous shifts of 2 x 9-hours or 2 x 10-hours

Gadbois (1994) also reports on 9- and 10-hour shifts in French industry.

These shift schedules are employed in the Talbot-Poissy car production plant and at the Bouhier foundry (about 200 employees).

Following a recent agreement (13/4/94), the Bouhier foundry operates six days a week, 18 hours a day, with a workweek of 36 hours (instead of the previous five days a week and 38.5-hour workweek). The standard schedule of 2 x 8-hours over 5 days has been replaced by a 2 x 9-hours system over 4 days. The work is carried out by three shifts, two of which rotate and the third makes up the remaining time, notably on Saturday. See Table 2.8.

Previously from 1991 to 1993, "following a company agreement the Talbot-Poissy car production plant implemented, in 1991, a shiftwork schedule of five days a week (Monday to Friday), from 6.15 a.m. to 2.42 a.m., i.e. 96.25 hours a week. Rotating 10-hour shifts over 4 days are employed according to the schedule indicated in Table 3.8. The morning shift is from 6.15 a.m. to 4.29 p.m. and the evening shift from 4.29 p.m. to 2.42 a.m., with a 36-minute meal break. The length of the workweek is 38.5 hours." See Table 2.8 (Gadbois, 1994).

Table 2.8 : Two different shift schedules for a compressed working week

Bouhier	**Week 1**	**Week 2**	**Week 3**	**Week 4**
	M T W T F S S	M T W T F S S	M T W T F S S	M T W T F S S
Teams 1& 2	A A A A r r r	M M r r M M r	A A A A r r r	M M r r M M r
Team 3	r r M M S S r	r r M M S S r	r r M M S S r	r r M M S S r

Talbot-Poissy	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**
	M T W T F S S	M T W T F S S	M T W T F S S	M T W T F S S	M T W T F S S
	M M M M r r r	M M M r M r r	A A r A A r r	A r r A A r r	r M M M M r r

Key:

M = Morning shift, A = Afternoon shift, r = rest day

This was replaced in 1993, following a downturn in the car industry, by a 9-hour shift system, reported in BEST 9.

Belgium

Navigation officers in Belgium

Léonard (1994) reports on "the case of workers in the navigation office and more particularly those appointed to the works of the Basse-Sambre, although this was not at all an isolated case in this company, but simply the subject of our research.

Note : the Basse-Sambre is the part of the Sambre between Charleroi (5 km upstream) and the confluence with the Meuse in Namur. It is totally modernised in the sense that canals run along its whole length, allowing easy navigation for units of 1,350 tons. There are eight electromechanic locks

which are usually operated by two people. The hours of navigation mainly depend on the hours of sunrise and sunset. For the Basse-Sambre the operating hours are presently as follows :

Table 2.9 : Seasonal shift rota in navigation workers in Belgium

	Weekdays	Sundays
1 January – 15 March	7 am – 6 pm	8 am – 1 pm
16 March – 30 September	6 am – 7.30 pm	8 am – 6 pm
1 October – 31 December	7 am – 6 pm	8 am – 1 pm

The normal service provided by personnel corresponds to the operating hours of the works; additional security duties (on Sunday) or operating of the locks is also done.

The duties of personnel working during navigation hours consist of running the plant, mooring the boats, recovering floating debris, clearing the workpost and its surroundings, communication of information about the navigation and flow of the river, the collection of navigation dues and other administrative tasks. Although traffic has diminished (due, amongst other things, to the use of larger boats) and with it the workload, the simultaneous presence of two people is needed.

As a rule, seven people are appointed to each post but the framework is not complete and one should take absences for illness, vacation or rest days into account. In fact two people are accommodated on site and have to carry out security duties at the works at night one week out of two, and one weekend out of three (an alarm being connected to their house). As soon as an intervention is required, the services provided are taken into account. The working hours comprise non-stop duty of 13.5 hours per day in the summer and 11 hours in the winter. Except when a different agreement is made between the management and the employees, the sequences are as follows: Monday/Wednesday/Friday/Tuesday/Thursday/Saturday. These long hours are possible because the work is not hard. Furthermore, from a questionnaire we circulated, it emerges that the workers *are* happy with this alternation between work and rest: i.e. work one day out of two.

As the weekly work duration is 38 hours/week, a balance of 2.5 hours/week is held over in winter and a balance of 5 hours in summer, to which should be added 280 hours/year for 'non accommodated' (one weekend out of three) and about 200 hours for those who are accommodated on site (security duties together with operating the locks at night and on Sunday). It is certain that the ferrymen work on the same schedule. These hours arise from the fact that navigation time has to be reduced to a minimum.

Another example comes from the merchant navy where the pilots on the 'Escaut' work four days, the fifth being devoted to trips from home – place of work and back, followed by four days of vacation, divided equally between weekdays and weekends" (Léonard 1994).

Chapter 3: TWELVE-HOUR SHIFT SYSTEMS

Introduction

Twelve-hour shift systems are one of the commonest form of compressed working hours, probably because of the simple mathematics that allow this to fit into the 24-hour clock. 24/12 = 2, so that two shifts a day can cover the 24 hours, with the same changeover times every day (in the same way as 24/3 = 8, so that three 8-hour shifts also cover 24 hours, with the same changeover times every day).

Compressing work in this way means that a normal working week of e.g. 168/4 = 42 hours can be covered by teams that work 3 shifts one week (36 hours) and 4 shifts the next week (48 hours), giving an average of 42. The continuous working week of 168 hours can then be covered by four crews.

It is more common, however, to work with a 12-hour system that runs on continuously regardless of days of the week, with 2, 3 or 4 x 12 hour shifts in succession, averaging out the hours over a longer period. Table 3.1 shows a 4-crew system, working four shifts of each type consecutively, interspersed with four days off.

Table 3.1 : A 4-crew 4 x 12-hour shift system

	M T W T	**F S S M**	**T W T F**	**S S M T**	**W T F S**	**S M T W**	**T F S S**
M	A A A A	B B B B	C C C C	D D D D	A A A A	B B B B	C C C C
N	C C C C	D D D D	A A A A	B B B B	C C C C	D D D D	A A A A
O	B B B B	A A A A	D D D D	C C C C	B B B B	A A A A	D D D D
o	D D D D	C C C C	B B B B	A A A A	D D D D	C C C C	B B B B

Key: A, B, C & D are four-shift crews. M and N are Morning (day) and Night shift, O indicates days Off after Mornings, and o indicates days off after Nights.

Using five crews, to give a shorter working week of (on average) 168/5 = 33.6 hours, provides spare time to take annual holidays into account, and to cover expected normal levels of absence and training.

Table 3.2 shows a typical 5-crew system, with 4 shifts of each type consecutively, recycling after 60 days. Each crew gets an extended break of 12 days (3 blocks of 4 days) in every 60 days, and as this follows immediately after their normal days off, it amounts to a break of 16 days.

Table 3.3 shows a 12-hour shift system with 5 crews, but with only *two* of each shift type consecutively. The six consecutive days off in ten mean that 60% of days are free of work, although the first day off after the last night shift never feels like a day off to shiftworkers.

During the summer holiday season, from the beginning of June to the end of August, each shift crew is scheduled for 18 holiday days, with 2 days off both before and after them, and the crews that are not on holiday work four shifts on, four shifts off to cover this (see Table 3.4). Three training days are scheduled for each crew in January, April and September/October.

Table 3.2 : 12-hour 5-crew system, with 4 consecutive shifts

	smtw	tfss	mtwt	fssm	twtf	ssmt	wtfs	smtw	tfss	mtwt	fssm	twtf	ssmt	wtfs	smtw
M	A	C	B	D	A	E	B	D	C	E	B	A	C	E	D
N	B	D	A	E	B	D	C	E	B	A	C	E	D	A	C
O	D	A	C	B	D	A	E	B	D	C	E	B	A	C	E
o	C	B	D	A	E	B	D	C	E	B	A	C	E	D	A
B	E	E	E	C	C	C	A	A	A	D	D	D	B	B	B

Note: As each crew always works 4 of each shift, days of the weeks are grouped in fours, with only one crew shown against each block of 4.

Key: M=Mornings (or Days), N=Nights, O=Days Off after Days, o=Days off after Nights, B=extended Break

Source: Chemical works in the U.K.

Table 3.3 : A 5-crew 12-hour shift rota, with 2 consecutive shifts of each type

	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M
1	D	D	N	N	–	–	–	H	–	–	D	D	N	N	–	–	–	–	–	–	D	D
2	–	–	D	D	N	N	–	–	H	–	–	–	D	D	N	N	–	–	–	–	–	–
3	–	–	–	–	D	D	N	N	–	–	–	H	–	–	D	D	N	N	–	–	–	–
4	–	–	–	H	–	–	D	D	N	N	–	–	–	–	–	–	D	D	N	N	–	–
5	N	N	–	–	H	–	–	–	D	D	N	N	–	–	–	–	–	–	D	D	N	N

Key: 1,2,3,4 & 5 are the five crews. D = Days, N = Nights, H = Shift Annual Holiday entitlement. The full rota also contains training days, and statutory holidays.

Source: UPM – Kymmene's Caledonian Paper, Irvine, Scotland

Table 3.4 : A 5-crew 12-hour shift rota, over the holiday season

	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M
1	–	–	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	–	–	D	D	N
2	N	N	–	–	–	–	D	D	N	N	–	–	–	–	D	D	N	N	–	–	H	H	H	H	H
3	D	D	N	N	–	–	–	–	D	D	N	N	–	–	–	–	D	D	N	N	–	–	–	–	D
4	–	–	D	D	N	N	–	–	–	–	D	D	N	N	–	–	–	–	D	D	N	N	–	–	–
5	H	H	–	–	D	D	N	N	–	–	–	–	D	D	N	N	–	–	–	–	D	D	N	N	–

Key: 1,2,3,4 & 5 are the five crews. D = Days, N = Nights, H = Shift Annual Holiday entitlement. The full rota also contains training days, and statutory holidays.

Source: UPM – Kymmene's Caledonian Paper, Irvine, Scotland

More examples of rotas are given later in this chapter.

Using six crews, the average working week comes down to 168/6 = 28 hours. Forms of this are now appearing: the normal week is *not*, of course, 28 hours, but allowances for holidays and training days, and the cover for expected levels of absence can quickly make a 28-hour rota workable.

It is obvious in all these rotas how compressed periods of time at work result in extended periods of free time.

Handovers

One of the attractive efficiency features of 2 x 12-hour shifts, compared to 3 x 8-hour shifts, is that the quality of handovers should be improved. This can be depicted in two forms:

1. each shift crew usually hands over to the crew from which it took over; and
2. each shift crew is usually only away from work for 12 hours, so that the situation at work will be less changed than if they had been away for 16 hours.

The first point is important, because it is not uncommon in the three-crew situation for a shift crew to behave irresponsibly towards the crew that takes over from it. This is less likely to happen when the handovers are symmetrical.

The second point can be important in particular situations. Two examples that are commonly raised are:

1. an intensive care ward in a hospital, where patients go through phases of relative stability, and occasional sudden changes;
2. a modern chemical plant, where the process can be stable for prolonged periods, but then subject to abrupt dislocations.

Demonstration of handovers

In the 12-hour shift rota shown in Table 3.2, the handovers are as follows:

Table 3.5 : Types of handovers between shift crews: 12-hour rota

Primary Handovers	Number	Reverse Handovers	Number Handovers	Rare	Number
A → B	12	B → A	10	A → D	2
B → C	12	C → B	10	B → E	2
C → D	12	D → C	10	C → A	2
D → E	12	E → D	10	D → B	2
E → A	12	A → E	10	E → C	2
Total	60		50		10

Table 3.5 demonstrates this symmetry. Shift crew A deals with crew B 46% of the time, and almost equally in the roles of handing over and taking over; crew A also relates to crew E for 46% of the time, but only meets crews D and E 4% of the time, and only in one direction.

Table 3.7 shows how infrequent this is in the conventional 3x8-hour shift system shown in Table 3.6.

Table 3.7 shows that there are no reversals to the 68 (81%) of primary handovers in this rota, so that the symmetrical relationship in handing over only applies in the other 19% of handovers. Crew A deals with crew D for 40% (17/42) of the time, and with crew C for only 10% (4/42) of the time.

This kind of detailed analysis can be considered to be very important by management, because of the risk of errors and omissions at shift handovers. Some major disasters, such as Piper Alpha*, had their origins in faulty handovers (among other things). A valve under repair was not reported to the incoming shift at 18.00. When the duplicate valve went wrong, the nightshift crew switched over to the valve under repair, which leaked and caused an explosion.

Table 3.6 : Continental shifts (2-2-3)

	Week one	Week two	Week three	Week four
Shifts	M T W T F S S	M T W T F S S	M T W T F S S	M T W T F S S
6 am – 2 pm	A A B B C C C	D D A A B B B	C C D D A A A	B B C C D D D
2 pm – 10 pm	D D A A B B B	C C D D A A A	B B C C D D D	A A B B C C C
10 pm – 6 am	C C D D A A A	B B C C D D D	A A B B C C C	D D A A B B B
Rest Day	B B C C D D D	A A B B C C C	D D A A B B B	C C D D A A A

Table 3.7 : Types of handovers between shift crews: 8-hour rota

Primary Handovers	Number	Secondary Handovers	Number	Reverse Handovers	Number
A → D	17	A → C	4	C → A	4
B → A	17	B → D	4	D → B	4
C → B	17				
D → C	17				
Total	68		8		8

The argument is not, however, all one way: if good relationships are wanted between *all* shifts, a more even mixing of shift crews might be considered more useful.

Arguments from the literature

Knauth and Hornberger (1994) quote many of the reservations about 12-hour shifts from the research literature.

"Although e.g. 12-hour shifts seem to be rather popular among employees, there are some doubts as to whether:

- fatigue is too great so that energy reserves for performance have to be mobilized towards the end of the working time. In the long term this can cause health disturbances. Alertness is substantially decreased which could cause concentration gaps or even a risk of injuries
- after 8 hours of work a reduction of performance appears, the ability to concentrate ... reduces, and the risk of motor and cognitive errors increases (Knaupp, 1983)."

* Piper Alpha is remembered as the United Kingdom's worst ever offshore oil disaster. It occurred on the evening of 6th July 1988, on Occidental's Piper Alpha platform located 110 miles north-east of Aberdeen. The platform was rapidly engulfed by fire and it appears that the Company's emergency procedures failed to be implemented properly, with the result that many personnel found themselves trapped on board without organised means of escape. This tragedy claimed the lives of 165 of the 226 people actually on board the platform, plus 2 crew members of the Fast Rescue Craft *Sandhaven,* which was attempting to assist survivors. The Honourable Lord Cullen chaired a Public Enquiry, lasting over a year, into the circumstances surrounding the disaster and this yielded far-reaching recommendations concerning the organisation of work and safety procedures on North Sea oil installations for all companies involved in this area. For full details, please refer to Lord Cullen's official report, published in two volumes by HMSO (1990).

The content and environment of work are obviously critical in moderating whether these problems are more important than the attractive side of compressed working hours.

Münstermann and Preiser (1978), referring back to Loskant (1970), worked out requirements to be fulfilled if contemplating 12-hour shifts:

- a high portion of stand-by work
- physically light work
  - work in control rooms
  - easy machine operations with longer gaps
  - periodical plant control rounds
- permanent medical monitoring
  - clinical start check-up
  - periodical observational check-ups.

According to Wallace (1989), Tsaneva et al. (1990) and Ong and Kogi (1990), extended workdays should only be contemplated if:

1. the nature of work and the workload are suitable for extended working hours;
2. the shift system is designed to minimize the accumulation of fatigue;
3. there are adequate arrangements for cover of absentees;
4. overtime is not added;
5. toxic exposure is limited;
6. it is likely that a complete recovery after work and high acceptance of the working time arrangements are possible (e.g. taking into account factors such as housing, family problems, commuting, climate, moonlighting).

Gadbois (1994) points out that little research on 12-hour shifts has been done outside the United States and Australia (Rosa, 1991; Rosa & Bonnet, 1993; Williamson et al., 1994).

Examples of 12-hour shift systems

Knauth and Hornberger give some interesting examples of shift systems from Germany.

Table 3.8 shows an example of a shift system in the German chemical industry.

Table 3.8 : 12-hour shift rota with single shifts of each type (Germany)

Week	Mo	Tu	We	Th	Fr	Sa	Su
1	D	N	O	O	D	N	O
2	O	D	N	O	O	D	N
3	O	O	D	N	O	O	D
4	N	O	O	D	N	O	O

Key:

D = Day shift, N = Night shift, O = Day Off.

The fact that there are only single night shifts spread over the shift system corresponds to ergonomic recommendations for setting up shift systems (Knauth, 1993). The same shift system was judged in another company to be more favourable than an 8-hour shift system (Nachreiner et al., 1975).

Another example used in the control room of a hospital is shown in Table 3.9. Although the four days with 12 hours may be stressful, there are long recreation periods and a fortnight with no shiftwork at all (weeks 11 and 12) (Meggender, 1993).

Table 3.9 : 12-hour rota from a German hospital

Week	Mo	Tu	We	Th	Fr	Sa	Su
1	D1	D1	N	N			
2				D1	D1	N	N
3							D1
4	D1	N	N				
5			D1	D1	N	N	
6						D1	D1
7	N	N					
8		D1	D1	N	N		
9					D1	D1	N
10	N						
11	D2	D2	D2	D2	D2		
12	D2	D2	D2	D2	D2		

Key:

D1 = day shift 0700 – 1900
D2 = day shift 0700 – 1530
N = Night shift 1900 – 0700

Conrad-Betschart (1990) shows an example of shift rotation with 12-hour shifts in a Swiss oil refinery (Table 3.10). Each odd week the working time is as long as 60 hours followed by a week with 24 hours' working time, so that the average working time of 42 hours per week can be achieved.

Table 3.10 : 2-2-3 12-hour shift rota from a Swiss oil refinery

Week	Mo	Tu	We	Th	Fr	Sa	Su
1	D	D			N	N	N
2			D	D			
3	N	N			D	D	D
4			N	N			

Key:

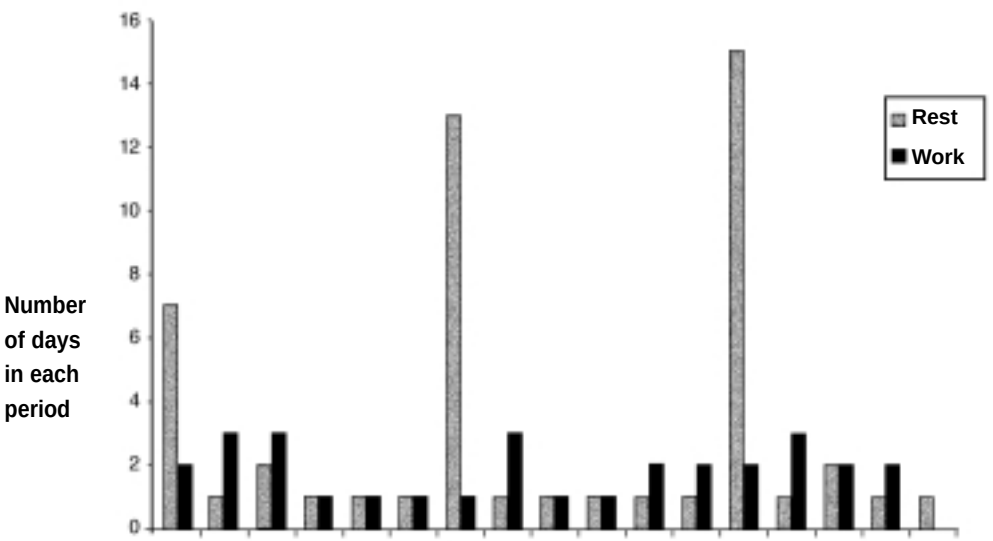
D = day shift 0630 – 1830
N = Night shift 1830 – 0630

Gadbois (1994) reports that 12-hour shifts have not been studied much in France. Rotating 12-hour shift schedules are used in some hospitals, especially in certain types of units (emergencies, intensive care) (Gadbois, 1981).

"They are also used by the Paris airports authority in the customs service, which we have recently studied" (Gadbois & Prunier, 1994). "A three-day working week of 36 hours is used: two 12-hour dayshifts (7 am to 7 pm) and one 12-hour nightshift (7 pm to 7 am), according to a day/day/night sequence, which can be modified in accordance with unforeseen events at work and the occasional wishes of the employees."

An example for an individual is shown in Figure 3.1, which illustrates the sequences of 12-hour shifts over three consecutive months, and shows long sequences of consecutive days off.

Figure 3.1 : Sequence of work and rest periods over 3 months for a customs officer at a French airport



Rest and work periods presented in their succession from left to right

The Antwerp oil refinery

Léonard (1994) reports on a change from 8-hour to 12-hour shifts at the RBP oil refinery in Antwerp:

"The oil refinery RBP in Antwerp is a company where the workers worked an average of 38 hours per week. In the context of continuous work, 3 shifts of 8 hours each covered the daily 24 hours. The fourth shift was at rest. Shift changes took place at 6 am, 2 pm and 10 pm. Production was organised in cycles of 28 days. For a shift it involved successively, for example, 7 periods of duty from 2 pm to 10 pm, then 2 days' rest, 7 periods of duty from 6 am to 2 pm, 3 days' rest and 7 nights followed by 2 days of rest. This production cycle was repeated 13 times per year. Now, average working time is only 36 hours/week distributed in 12-hour days. There are still 4 shifts but only 2 are active on any day (one day shift and one night shift, each of 12 hours). Shift changes take place at 7 am and 7 pm. Following this schedule, each shift works 14 times as part of a production cycle of 28 days. However, in this way, we get to an average weekly working time of 42 hours. By mutual agreement with his boss, each worker takes 2 more days' rest to reach the 36 hours week. It is not accurate to describe this as a system of 3 x 12-hours per week, because it depends on the way the worker takes his days off. It could be that he works 4 days, but he can also stay at home for 7 days in a row. He needs to work 12

days as part of the 28 day production cycle which involves, depending on the case, 4, 3, 2 or even 1 working day per week. Only shift workers are covered by this system. For the others (maintenance, personnel, marketing, finances, ...) nothing has changed apart from the reduction in working hours to 36.

This reduction of working hours is on a par with a salary cut. The effects of this cut are distributed 50/50 between the workers and the employer. One should add the cost of taking on additional workers at the rate of 5% of the total number. The workers consider this a better system: they only work 12 days in the context of a 28-day production cycle, and have two weekends rest out of four. Tiredness is said to be less and the starting times at 7 am and 7 pm allow the worker to have a meal with his family before or after work.

Humanisation was the real driving force behind this modification: the personnel are more motivated, and their professional satisfaction is higher. For the company it has also been positive, because absenteeism dropped significantly and efficiency increased. The company admits willingly that this system can be applied in the chemical sector because personnel have a supervisory role, and there is little physical effort imposed by the work. Further evidence for this is that the company is studying the possibility of adding maintenance work to the night shift to overcome monotony and boredom. Such a system cannot be put into practice in all companies.

12-hour shifts at weekends

Léonard (1994) also reports on a Belgian company that uses the feature of additional hours paid for time worked at weekends to create a "full-time" week out of 2x12-hour shifts at weekends:

"The chocolate producing company Jacques practises a system called shift relays: 12 hours on Saturday and Sunday paid the equivalent of full time, so as to meet an increasing demand for Jacques chocolate. The day finishes at 6 pm, which allows people to spend the evening with the family, especially in summer when the days are longer. We considered that there was a problem with such an early start of work as 6 am."

Twelve hours comes and goes

In the United Kingdom, some firms are introducing 12-hour shifts, at the same time as others are abolishing them, and still others are reviewing them. One electronics company, using a 4-on/4-off continuous 12-hour system, decided that there were too many mechanical breakdowns and stock shortages at weekends. They therefore reverted to a weekly rotating Monday-to-Friday discontinuous shift system (with some overtime at weekends).

A chemical company introduced 12-hour shifts on a trial basis, partly because it was feared that the forthcoming European directive on working time would ban the "quick change" back that was a feature of their previous rapidly rotating shift system. The 12-hour system has now been retained, but not without some controversy among the workforce.

A large paper company inquired whether 12-hour shifts could be partly responsible for a prolonged plateau where there had previously been a steady increase in production in a new, large paper works. The standard answer has to be that it *could* be but that considerable detailed study would be required to establish this.

Gadbois (1994) notes that Ong and Kogi (1990) have reported the use of 12-hour shifts in several developing countries in Asia, and in particular their

sudden adoption and subsequent abandonment *within* one year by numerous industries in Singapore.

Longer than 12 hours

From the services sector, Knauth and Hornberger (1994) report some examples with extended daily working time:

- police e.g. 9, 10, 12 or 16 hours
- fire brigade e.g. 10, 12, 14, 16 or 24 hours (including stand-by)
- drivers of breakdown lorries e.g. 10 or 14 hours
- transport workers at the airport e.g. 9 or 10 hours
- ambulance drivers e.g. 12 or 14 hours
- nurses e.g. 9, 10, 11 or 12 hours
- broadcasting stations e.g. 9, 10, 11 or 12 hours.

"However, in the services sector a prolongation of daily working time is not always combined with a reduction in working days per week, i.e. these working time arrangements do not always correspond to the definition of 'compressed working time' cited above."

Chapter 4 : EXTENDED SHIFTS FOR PART-TIME WORKERS

Introduction

Compressed working time is most commonly associated with full-time work, but there is no reason in principle why it cannot also affect part-time workers. This chapter gives some examples of how extended hours can be used in part-time work.

Belgium: Hospital and retail sectors

Léonard (1994) gives an example from the hospital sector "where permanent night duty is organised as follows: work starts at 9 pm until 7 am, that is to say 10 working hours. In the first week, part-timers work Friday, Saturday and Sunday. In the second week they work Monday, Tuesday, Wednesday and Thursday or vice versa. Two weeks' rest follow, as work does not start before the Friday of the second week, the first one being a complete week of rest."

Another more complex example comes from the retail distribution sector, where the hours of part-time workers are sometimes extended without much notice.

Léonard (1994) has examined the case of cashiers at three supermarkets; the problem is, however, a general one.

Hours are flexible from one day to another, sometimes with little advance notice (8 or 10 days beforehand), with evening hours (9 – 10 pm) as overtime. The hours are poorly distributed in time because cashiers with a 25 hour contract may very well have 3 hours at the beginning of the week and 9 or even 11 hours on Saturday. Their working time is concentrated within a very short and busy period, as the receipts from Saturday are nearly 40% of total weekly receipts. These hours isolate the cashiers from each other, because their hours only coincide by chance, at breaks, and through meeting a few colleagues whose cash desks are located adjacent to their own. The variability of hours with evening work complicates the organisation of employees' private and social lives. The breaks allocated by the central cash desk (3 minutes per hour in Supermarket 1, 5 minutes per hour in Supermarket 2 and 20 minutes after 5 hours in Supermarket 3) may be postponed because of an influx of customers. This results in an uneven distribution of working time: a break taken too early in comparison to their starting time becomes a less useful break, and it is very hard to get one at the end of the day. The cashiers interviewed sometimes mentioned the arbitrary way in which breaks are negotiated and that they can be vulnerable to losing their relief altogether, especially on Saturdays. Cashiers can be asked to stay 1 or 1.5 hours more than planned or to leave early if the crowds of customers are less than foreseen. Otherwise, planned hours correspond to the time spent on open cash desks, but do not take into account the (paid) time to close the cash desk and to carry out the actions that follow closure of the cash desk (checking the amounts received, filling out the various slips, checking for possible mistakes). The use of software facilitates the working out of the schedules but they do not yet take into account exactly when a cashier signs off and, above all, the necessary rotation on cash desks considered to be particularly demanding (i.e. food and fast cash desks) because of their higher pace, and the cash desks located near the fresh product shelves and close to the entrances. Factors contributing to the development of a *negative image* of

the cashier's function include: i) the repetitiveness of the work; ii) time constraints; iii) reduced possibility of using personal initiative; iv) dependence on the hierarchy for both hours and breaks; v) lack of a career structure; and vi) absence of a feeling of community at work (because of the partition between the cash desk sector and the other sectors of the store). More importantly, a problem is created in terms of the job's social image, a mostly negative image which may have direct repercussions on the cashiers' own self-esteem. Such demotivation brings about a high level of absenteeism. On a battery of cash desks of 80 people, there are 10 cashiers permanently sick and some of them just disappear without even asking for their back pay. According to Françoise Guelaud, a sociologist at INRS, the search for external flexibility (with resort to specific-term contracts and to the casual employment of students at weekends) and internal flexibility (with contractual hours of very diverse duration) has direct consequences for both cashiers' working conditions and their lives outside the workplace.

Extended daily working time of part-timers

Knauth and Hornberger (1994) report comprehensively on the use of extended daily working time for part-time workers.

One of the most common part-time models is that of shortened daily work, i.e. the part-timers work 5 days a week with less than e.g. 8 hours per day.

But there are various examples showing that there are plenty of other possibilities for part-time arrangements, in which the part-timers work longer than 8 hours per day but less than e.g. 5 days a week. In addition to other factors, these models offer companies the possibility of extending operational time without any need to make changes in the working time rosters of the full-timers.

This was the case in a company in the food industry (Hoff et al., 1994). The new collective agreement made in 1992 makes it possible to extend operational time in several steps from 85 hours per week in a 2-shift production (5 morning shifts, 2 days off, 5 afternoon shifts, 2 days off) up to 144 hours per week.

In addition to the rotating full-time shift model with a working time of 38 hours per week, two groups of part-time workers were formed [Tables 4.1(a) and (b)].

Table 4.1(a)

	Mo	**Tu**	**We**	**Th**	**Fr**	**Sa**	**Su**
Group 1	N1	N1	O	O	O	D	N2

Key:

N1 = Night shift 2300 – 0600
N2 = Night shift 2000 – 0600
D = Day shift 0930 – 2000
O = Day off

Total working time = 32.5 hours/week.

[Note: 30-minute unpaid break per shift.]

Table 4.1(b)

	Mo	Tu	We	Th	Fr	Sa	Su
Group 2	O	O	N1	N1	N2	O	O

Key:

N1 = Night shift 2300 – 0600
N2 = Night shift 2300 – 0930
O = Day off

Total working time = 23 hours/week.

[Note: 30-minute unpaid break per shift.]

Source: Hoff et al. (1994), as cited by Knauth and Hornberger.

Another example comes from a company in the metal industry. 75% of the production employees work in a full-time 3-shift schedule and 25% in a part-time weekend schedule [Tables 4.2(a) and (b)].

Table 4.2(a): Full-time workers

Week	Mo	Tu	We	Th	Fr	Sa	Su
1	N	N	N	N	N	O	O
2	E	E	E	E	E	O	O
3	M	M	M	M	O	O	O

Key:

M = Morning shift
E = Evening shift
N = Night shift
O = Day off

Total working time = 37.3 hours/week.

Table 4.2(b): Part-time workers

	Mo	Tu	We	Th	Fr	Sa	Su
Always	O	O	O	O	M1	M2	N

Key:

M1 = Morning shift 0600 – 1500
M2 = Morning shift 0600 – 1600
N = Night shift 2000 – 0600
O = Day off

Total working time = 29 hours/week.

Source: Hoff (1991), as cited in Knauth and Hornberger.

When starting this working time arrangement, full-timers were offered the opportunity to decide whether they wanted to change to the part-time arrangement (as the income is approximately the same). If a worker wishes to change schedule, there are several possibilities:

1. he/she can wait till a job becomes free, and then has priority if his/her qualifications are adequate;
2. he/she finds an exchange partner with comparable qualifications. Permanent partnerships can also be built (e.g. 3 weeks full-time, 3 weeks part-time).

A similar working time arrangement was introduced in an Austrian tyre-producing company [Tables 4.3(a) and (b)].

Table 4.3(a): Full-time workers

Week	Mo	Tu	We	Thu	Fri	Sa	Su
1	O	N	N	N	N	O	O
2	E	E	E	E	E	O	O
3	M	M	M	M	M	O	O

Key:

M = Morning shift 0600 – 1400
E = Evening shift 1400 – 2200
N = Night shift 2200 – 0600
O = Day off

Total working time = 37.3 hours/week.

Table 4.3(b): Part-time workers

	Mo	Tu	We	Th	Fr	Sa	Su
Always	N2	O	O	O	O	M	N1

Key:

M = Morning shift 0600 – 1600 (1 hour unpaid break)
N1 = Night shift 2000 – 0600 (1 hour unpaid break)
N2 = Night shift 2200-0600 (15 minutes paid break)
O = Day off

Total working time = 26 hours/week.

Source: Hoff (1992), as cited in Knauth and Hornberger.

There are several factors to consider for or against a combination of full-time and part-time arrangements (Hoff, 1992):

+ Willingness in connection with the introduction of night and weekend work is becoming an absolutely essential condition.
+ Private commitments of individuals in general occur at constant times and rotating schedules make less allowance for them.
+ Free-time interests of individuals usually differ from one another and uniform rotating shift schedules do not take this into account.
+ Agreed reductions in working time are easier to achieve in combined full-time/part-time arrangements than in pure full-time systems.
+ Differentiated sizes of working groups in night and weekend shifts are much easier to achieve.
– Internal communication is more difficult.
– Higher incomes due to additional payments for permanent night or weekend work can cause strong habituation effects, thus making a change to other shift forms more difficult.
– In order to motivate qualified full-time workers to change to a part-time schedule, considerable financial incentives may be necessary" (Knauth & Hornberger, 1994).

Chapter 5 : EXTENDED RUNS OF CONSECUTIVE WORK DAYS

Introduction

Normal working days of eight hours can also achieve some of the big breaks characteristic of compressed working hours by working a long sequence of consecutive days and thus accumulating a longer period of rest days.

This led to some battles of principle when rapidly rotating shifts appeared in the UK about 1960: was the 2x2x3 shift system equivalent to seven consecutive working days, or did the 24-hour break after the two "2"s interrupt this long sequence? At least one trade union preferred the 2x2x2 because of this principle.

Long sequences of seven days of the same shift are not uncommon, using the same pattern of days off as the 2x2x3 but without the rapid rotation: 7M, 2 off, 7A, 2 off, 7N, 3 off. In this chapter, Léonard reports on the use of systems like this in Belgium.

Other systems using long sequences of consecutive days are also covered here, with the exception of oil production and exploration (and similar work away from home) which is covered in Chapter 6.

Examples from Belgium

Léonard (1994) reports that in the Belgian steel industry, systems that involve work on 21 consecutive days followed by 7 days of rest are common, and have been studied by his group. "The system was a sequence of 7 mornings, 7 afternoons, followed by 7 nights. This sequence is preferable in our opinion to anti-clockwise rotation because it places the long rest period after the night shift (which is more tiring). There is also a break of 24 hours between the end of the last morning shift and the beginning of the afternoon shift and (another 24-hour rest period) between the afternoons and the start of nights."

He gives a second example from the hospital sector. "We have carried out a study in five homes for elderly people. The night shift is permanent and its hours are from 9 pm until 7 am, from Friday evening to Friday morning, that is 7 consecutive nights. As well as recommending a shorter rotation, we pointed out a little-studied problem, namely that the choice of the starting day can be important. 86% of the personnel (18/21) are married and have children. The first night ends on Saturday morning, when the children are off school and therefore likely to introduce a disruptive element of noise into the mother's day sleep. Balancing this, the father is usually at home and can thus take care of the children, but that may be true even if the cycle starts on another day. The second night ends on Sunday, where we find the same disrupting noise, compounded by a wish on the part of the wife to spend Sunday with her family. This tends to diminish sleeping time even more. The night worker thus starts her third night with a serious sleep deficit, which would not be true if the cycle started on Monday, with Sunday at the end of the cycle."

Thirdly, he reports on "the results of a study we carried out at Unisac at the end of 1993, where we moved from a long cycle (7 mornings, 2 rest days, 7 afternoons, 1 rest day, 7 nights, 4 rest days) to a system of short rotation (2 mornings, 2 afternoons, 2 nights, 4 rest days) in 1991. Tiredness remains the

same as on the previous system, according to the workers, but they freely admit that they take fewer precautions and would, for example, go out later at night even though they have to work at 5 am the following morning. This puts their reports into perspective. From the family point of view, the majority consider the present situation more favourable to a harmonious family life. The health balance is positive and there is a general feeling that they will cope better with short rotations than with long ones" (Léonard, 1994).

Lastly, he notes two systems with long sequences in the chemical industry:

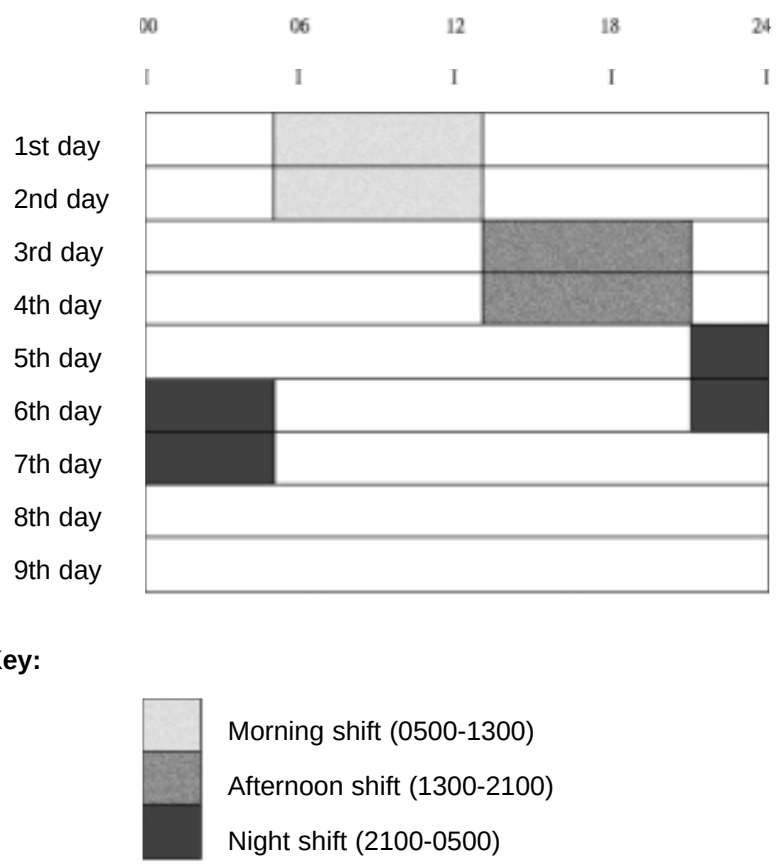
A) 7 mornings from Wednesday to Tuesday from 7 am to 3 pm (2 pm on Sunday as the afternoon team works 1 hour more at the request of the workers), 2 days' rest, 7 nights from Friday evening to Thursday evening from 11 pm to 7 am, 3 days' rest, 7 afternoons from Monday to Sunday and 2 days' rest, giving an average of 42 hours/week with recovery days available on request by the worker.

B) 7 mornings from Wednesday to Tuesday from 6 am to 2 pm, 2 days rest, 7 afternoons from 2 pm to 10 pm, 2 days' rest, 7 nights from 10 pm to 6 am and 3 days' rest. Rest days are taken on predetermined days" (Léonard, 1994).

Examples of seasonal shift schedules from Italy

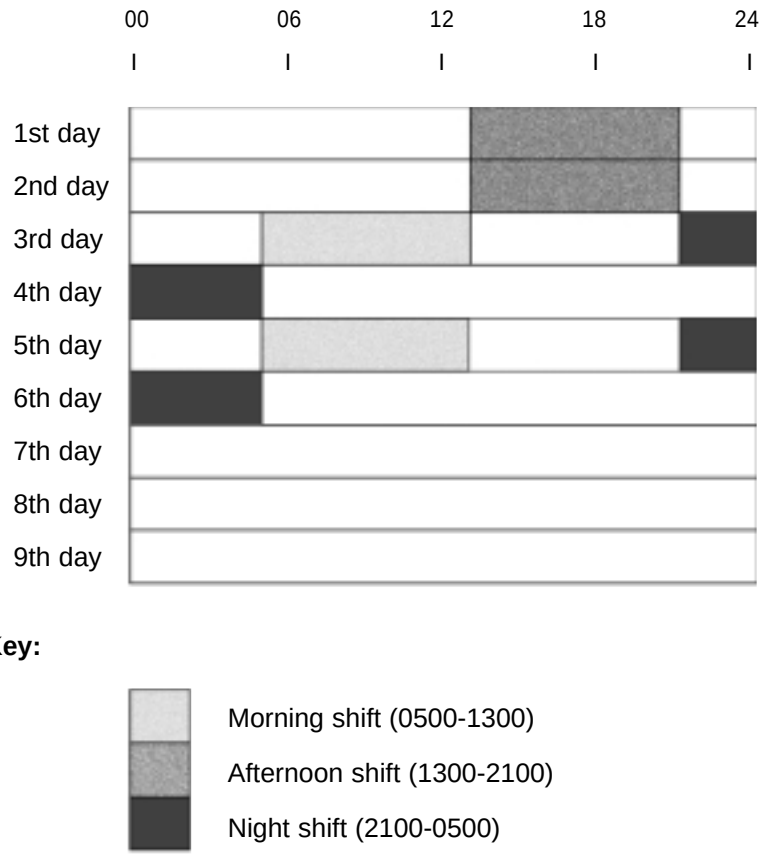
In a large paper mill in Northern Italy, shiftworkers are engaged on a '3x8' shift schedule with fast, forward rotation: 2 Morning shifts (0500-1300), 2 Afternoon shifts (1300-2100), 2 Night shifts (2100-0500), and 2 rest days (Figure 5.1). In some periods of the year, mainly in spring and autumn when many workers are involved in agricultural activities (as a second job), they change the sequence of the shifts to having Morning and Night shifts in the

Figure 5.1 : Normal shift schedule in the paper mill factory



same day (Figure 5.2). This permits them to have one more full rest day per cycle, compressing their primary work activity into 5 days over a 9-day cycle" (Costa, 1994).

Figure 5.2 : Seasonal shift schedule in the paper mill factory



Chapter 6 : THE OIL INDUSTRY AND OTHER SERVICE AWAY FROM HOME

Service at a workplace which is far away from home is comparatively rare, but not unknown. Perhaps its most well-known occurrence is in the offshore oil industry, but other jobs can also involve similar work away from home for extended periods. Because of this, they are open to (and indeed favourable to) forms of compressed working time.

The commonest pattern of work in the North Sea oil industry is for 14 working days of 12-hour shifts, followed by 14 days' shore leave. The 14 days of work are usually split into a week of days and a week of nights. As there is little to do on an oil installation other than work, sleep and eat, a 12-hour shift system can be expected to be much less arduous than onshore: no time is spent travelling to work, and there are no interruptions or distractions from domestic or social life. Conditions such as noise are likely to be similar at all times of day, without the relative peace of night time on land.

Because it is common practice to change from days to nights, and vice versa, halfway through the tour of duty, the biggest time of potential strain comes at the switch over. At one time, this was achieved by one shift working 24 hours without a break, while the other shift rested. This was obviously highly dangerous and tiring, and in recent years it has become common to switch to an 8-hour rotation for the day of the changeover.

Table 6.1 : Example of a changeover shift system on an oil installation

Days:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Time														
0-4	A	A	A	A	A	A	A	A	B	B	B	B	B	B
4-8	A	A	A	A	A	A	A	A	B	B	B	B	B	B
8-12	B	B	B	B	B	B	B	B	A	A	A	A	A	A
12-16	B	B	B	B	B	B	B	B	A	A	A	A	A	A
16-20	B	B	B	B	B	B	B	A	A	A	A	A	A	A
20-24	A	A	A	A	A	A	A	A	B	B	B	B	B	B

In this example, on day 8 – the changeover day – the day shift (B) work an 8-hour shift from 0800 to 1600, then the previous night shift (A) come back on for 8 hours, before B work a short 8-hour night shift. On day 9, full 12-hour shifts are worked. (The changeover times and other details are not taken from a real situation, but constructed to suit the purposes of the example.)

One recent study found that 54% of offshore oil-workers reported sleep problems, significantly more than the 36% of matched onshore workers (Parkes, 1993). For sleep quality, she found an interesting interaction: onshore, sleep quality ratings were more favourable for dayshift work than for

nightshift work, but the opposite was true offshore. For sleep duration, the onshore operators were significantly sleep-deprived during nightshift, dropping to an average of 5.89 hours from their dayshift mean of 7.1, while the offshore operators actually reported slightly longer sleeps on their nightwork (7.18 hours) than their daywork (6.97 hours). Older employees reported significantly less sleep than younger employees, relative to their sleep during leave periods, and this was particularly true during nightshift periods. A more modern installation offshore reported slightly longer sleeps than an older one, perhaps because of a better separation of production and accommodation areas.

Recent thoughts from Aberdeen

Research undertaken by Slaven and her colleagues (1995) at The Offshore Management Centre, Robert Gordon University, Aberdeen also indicates that the established effects of different shiftwork patterns on 'normal' workers cannot *necessarily* be generalised to the distinctive environment found offshore. Having made a comprehensive literature review, they note that Parkes (1993) has carried out the only comparative study of on- and offshore shiftwork in the UK. Her findings suggest that offshore workers do not complain of less overall sleep when working extended nights in the way that onshore workers do. Further, they report higher subjective sleep quality on nightshift (this latter being the very opposite to the situation experienced by onshore workers). Parkes therefore asserts that the 'round the clock' environment which prevails offshore may actually make adapting to nightwork easier.

A Norwegian study carried out by the Rogaland Research Institute in 1989 yields rather different conclusions. The research team in this case discovered that offshore workers doing 12-hour nightshifts experience high levels of both sleep disturbance and psychosomatic health problems (e.g. digestive upsets, headaches), whether with continuous or rotating shifts.

Turning to the subject of performance and accidents, Lauridsen and Tonnesen's study (1990) is found to be of particular interest. In an analysis of Norwegian drilling injuries, it revealed a significant increase in injury rates on mid-rotation shift change days, and also much higher injury levels between midnight and 6 am as opposed to 6 pm and midnight, which suggests that the drill crews are vulnerable to dipping circadian rhythms during those early hours.

Slaven et al. observe that it is unclear whether the increased incidence of accidents and fatigue is attributable to nightwork itself or to extended periods offshore. Also, while some offshore workers might prefer shorter rotations in the interest of reducing fatigue, others would not take kindly to the strain of extra partings and reunions, shorter breaks or more helicopter flights. There would also be significant economic implications for employers.

Research undertaken by Slaven's own team in 1992 and 1995 hints that, taking overall stress into account, offshore workers do typically prefer a 14:14 rotation over a 21:21 rotation, largely on the basis of their partners' and families' wishes. The workers surveyed also cited 14 days as the maximum sensible offshore rotation in safety terms.

Slaven's 1995 survey reveals that, to date, 14:14 persists as the most common rotation pattern (operated by 18 of the 22 companies studied) and 7 am/7 pm as the typical shift start and finish times (within 14 companies). 12-hour shifts are universal, other than at the point of any mid-hitch rollover (which about half of the companies surveyed still have in place, despite the fact that research has often found them to be markedly unpopular with employees. They tend to be used only in the case of 14-day or longer rotations). A large number of companies operate more than one rotation pattern and shift length *simultaneously,* for different groups of workers.

Cost reduction is the main impetus for moves toward a 21:21 schedule, with companies needing to tightly control their costs in order to extract the North Sea's remaining reserves at a profit. The ambiguous nature of current research findings concerning the impact of rotation patterns on employee health and performance makes it distinctly difficult to give employers firm advice on what is the best schedule to adopt.

The review conducted by Slaven and her colleagues amply demonstrates a need for more, and more specific, research in this area. Certain conclusions can, however, be *tentatively* drawn from the data we have, as she states in her paper for the 12th International Symposium on Night and Shift Work (Slaven, 1995).

The research on shift work patterns in terms of hours worked indicates that night work in general can be more problematic than day work, though the difficulties may be somewhat lessened offshore due to the unusual work environment. It would appear that straight shifts (all days or all nights per rotation) are preferable to a mid-hitch roll over (one week of nights, then one week of days).

"Careful consideration should be given to the merits of applying longer rotation patterns for the entire platform staff (i.e. longer than 14 days). The job demands are not equivalent across offshore occupations and certain safety critical positions such as OIM* and control room operator may need to be evaluated independently."**

Italian oil rig workers

Costa (1994) reports that Italian "oil rig workers engaged on platforms for oil research and extraction, particularly on sea platforms or in desert regions of African and Asian countries, usually alternate long working periods at the workplace with corresponding long off-duty periods at home, due to the distance between working sites and home.

"Periods of continuous work are arranged from a minimum of 7 days to a maximum of 35 days. Each duty period is followed by the same amount of off-duty days at home.

"Depending on the work place (on the mainland, at sea or in a desert region) and the distance from home, the work periods are arranged in the following way:

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* Offshore Installation Manager.

** In this context, it is worth noting that the role of the OIM received significant criticism at the Public Inquiry into the Piper Alpha disaster (as referred to on page 17).

Work in Italy

– *on mainland:* – only day work; at night only on call
  – 10 hours per day (0700-1200 and 1400-1900)
  – 10 days work / 8 days rest

– *on sea platforms:*
  – day work: 0700-1200 and 1300-2000 (12 hours per day; at night only on call)

– shiftwork:
  – "3x8" system (0400-1200/1200-2000/2000-0400); 6 days' work (2 Afternoons, 2 Mornings, 2 Nights) / 2 days' rest;
  – "2x12" system (1200-2400/2400-1200); 7 or 14 workdays (on the same shift) / 7 or 14 rest days

Work abroad

(Africa, Middle East) both on sea platforms and desert regions:

– only shiftwork in "3x8" (in the past) or in "2x12" (nowadays) systems (08-20/20-08 or 12-24/24-12);
– periods of 21 or 28 or 35 workdays alternating with corresponding periods of 21 or 28 or 35 days' rest.

A group of technicians involved in such activities has recently undergone a medical check in our Institute.

Most of them had experienced the passage from the previous work schedule based on an 8-hour shift (alternating continuously 8 hours' work and 8 hours' rest) to the new schedule on a 12-hour shift. They reported a high appreciation for the new schedules with particular reference to sleep, which improved both in quantity and quality, giving more time for recovery and reducing fatigue.

Some people make arrangements with colleagues preferring to maintain the same shift (day or night) for all the duty period, declining to alternate every week as most workers do.

Where work satisfaction is concerned, most people consider this job as a temporary activity while looking for a job nearer home. In fact, most people work abroad for 6-7 years, on average, attracted initially by a 'sense of adventure' and the high salary. As the years pass, tolerance for the job decreases, not only due to its strenuous elements (lifting weights, climbing stairs, unfavourable climatic conditions) but mainly because of the social conditions (long periods of isolation in monotonous environments and in close contact with the same people).

Chapter 7 : EVALUATIONS

Introduction

As compressed working hours spread, questions are bound to be raised about how well such systems work. Employers need to know how efficiency and productivity may be affected, including related issues such as handover effectiveness and absenteeism. Employees want to know if the promise of more work-free days is spoilt by the need to recover from the effects of longer working periods.

It should also be noted that the spread of such systems may be limited by employment legislation. The European Directive on the Organisation of Working Time sets a broad framework, that discourages but does not totally rule out long shifts. What really matters, however, is the detail of how this directive is implemented in national law. In the Netherlands, for example, the new law puts a limit of 9.5 hours on shift length. In this context, Hoekstra, Jansen and Van Goudoever write:

"In view of the increasing variety and flexibility of working patterns, the introduction of the compressed working week on a very large scale is not highly likely. However, this structure of working hours can present an attractive alternative for certain companies and groups of employees. When the structure is successfully implemented there is a 'no lose' situation for both the company and the employees" (Hoekstra, Jansen and Van Goudoever, 1994).

Evaluation of compressed working time: ideas from France

"In debates on the compressed workweek, the first criterion put forward is general: acceptance of the work schedule. Although this criterion appears telling, it is in fact very unclear. It implies only that the advantages have been judged to outweigh the disadvantages, without consideration of these. Will this present judgement be maintained in the future? Will initially unnoticed drawbacks appear in the long term, leading to a retrospective reappraisal of the initial decision? Various observers have stressed that acceptance of such a system does not imply the absence of drawbacks, but simply that these may be compensated for by the particular importance attached to the positive features of the system.

"For example, in a large hospital, where two-thirds of the staff on nightshifts operated an alternating sequence of 7 nights on (10.5 hours per shift) and 7 nights off, a governmental decision has recently reduced the workweek of nightstaff from 39 hours to 35 hours. A management proposal reducing the number of successive nights worked was rejected by the staff in question, who recognised that seven consecutive nightshifts result in fatigue but preferred to keep the existing system, for a variety of reasons. Rosa (1993) has likewise reported that 12-hour shiftworkers in a gas plant considered these shifts tiring, but preferred to keep the system because of the advantages it offered in terms of leisure activities.

"When analysed in more depth, the available results do not allow general conclusions to be drawn, particularly as studies are scarce, and assessments must be differentiated in terms of the criteria employed, work schedule

characteristics, the nature of the tasks performed, and the situation of the employees outside the work setting" (Gadbois, 1994).

Compressed working time and efficiency: France

Gadbois reports that the efficiency of compressed working time has been analysed in the hospital sector in a series of studies devoted to the evaluation of 12-hour shifts worked by the nursing staff. The results are not in complete agreement, due perhaps to contextual and methodological differences in the application of work schedules. It would seem, however, that the quality of patient care is lower with 12-hour shifts than with shifts of 8 hours (Todd et al., 1989).

Compressed working time and efficiency: Canada

Kelly and Schneider (1982) reviewed the risks for 12-hour shifts for Ontario Hydro, which operates hydroelectric, fossil fuel and nuclear-generating stations in Canada. Based on analysis of some non-nuclear plants where 12-hour shifts had been introduced and an extensive literature review relating to the shiftwork performance variables, they concluded that replacement of the 3 x 8-hours schedule by one of 2 x 12 hours would result in an increase of between 80% and 180% in risk of error, depending on the task.

Rosa and Bonnet (1993) have thrown further light on this question through measurements of alertness and performance during a battery of experimental tasks carried out at different times of the working day by 12-hour and 8-hour shiftworkers. Performance and alertness were diminished during the 12-hour shifts.

Productivity: the experience of the Netherlands

Hoekstra, Jansen & Van Goudoever (1994) report some interesting evidence on productivity and long hours: "Changes in productivity, in other words the average amount of work done per hour, is one of the criteria for assessing the success of the compressed working week. There can be changes in both the number of hours and the amount of work done per hour as a result of the compressed working week.

"The number of hours can change as a result of a reduction in willingness to do overtime after a long working day. The amount of work per hour may either improve or worsen under the influence of, for example, fatigue as the result of a longer working day, the availability of colleagues for consultation, improved coordination between available labour and the supply of work and so on. There is little concrete statistical data available on changes in productivity. Information concerning effects on productivity is generally based on subjective assessments made by management and employees.

Employees on productivity

"It has emerged from several studies that people working a compressed working week do less overtime on working days as a result of the long working day. However, this is compensated for by overtime on the additional day off (at home).

"At Schiphol Airport, observations established what type of activities employees engaged in during the day. It emerged that on average during the afternoon, there is no difference in productive working time between employees with, and those without, a compressed working week.

"On average, employees believe there is an increase in productivity rather than a decrease.

Managers on productivity

Of the 28 companies studied by the Wages Department (1992), 68 per cent thought productivity remained constant. The number of companies stating that there had been an increase in productivity was approximately equal to the number stating the opposite.

Research carried out at the Ministry of Transport, Public Works and Water Management paints a similar picture. Both positive and negative effects are found, depending upon the practicalities of the situation" (Hoekstra, Jansen & Van Goudoever, 1994).

Hoekstra, Jansen & Van Goudoever (1994) also report a study by the Dutch Wages Department with a survey of 28 companies and their operating time before and after the introduction of a compressed working week.

Table 7.1 : Operating time before and after the introduction of a compressed working week

Operating time before introduction	Operating time after introduction	Increase in operating time	Number of companies
(hours)	(hours)	%	N
36	45	25	2
37.5	45	20	1
38	45	18	7
40	45	13	9
38	47.5	25	1
40	47.5	19	5
40	50	25	1
40	60	50	1
44	50	14	1

Source: Loontechnisce Dienst, 1992 (Wages Department)

It is clear that most of the companies studied increased operating time from 38/40 to 45 hours (5 days of 9 hours) or from 40 to 47.5 hours (5 days of 9.5 hours). Total operating time increased by an average of 15 per cent. The accessibility of the company as a whole therefore also increases.

But what about the accessibility of individual employees? The accessibility of individuals is of particular importance for contacts which cannot easily be dealt with by a colleague and for contacts of an urgent nature.

Experience at the Ministry of Transport, Public Works and Water Management indicates that, on average, employees with and without a compressed working week are equally accessible.

Employees with a compressed working week are accessible for longer early in the morning and late in the afternoon than employees with an eight-hour working day. Accessibility does vary from day to day, however.

It emerges that accessibility is worse on Friday and better on Monday in the case of employees with a compressed working week. The explanation for this is that Friday is most often rostered as a day off.

Coordination and manageability

Because of discrepancies between individual timetables in a compressed working week, employees are often not present at the same time. As a result, the need for good coordination and handover of work increases.

In research carried out by the Loontechnische Dienst (Wages Department) and at the Ministry of Transport, Public Works and Water Management, one third of managers indicate that they have problems with manageability as a result of the compressed working week.

Research at Schiphol Airport indicates that managers and employees encounter two principal problems. The scheduling problem – finding a suitable day for meetings – proves to be a thorny one if several employees with a compressed working week are involved. Approximately 25 per cent of employees had frequent problems in this respect. The second problem concerns the handover of work. This problem particularly involved employees with many tasks of short duration, as in secretarial work.

Absenteeism

"Absenteeism is one of the factors which a compressed working week can influence. Fatigue as a result of longer working days can result in higher levels of absenteeism. However, the extra day off can compensate for absenteeism because this day provides an opportunity for a rest. In addition, this day off during the week can be used for visits to the doctor, dentist etc. so that short absences may decrease. It is worth pointing out that a drop in absenteeism can be expected on statistical grounds. This is related to the opportunity to report illness: people will usually only report illness on working days. With a compressed working week, there are fewer opportunities for reporting than with an ordinary working week" (Hoekstra, Jansen & Van Goudoever, 1994).

A similar problem about the number of potential reporting days has limited acceptance of the accident study by Laundry & Lees (1991), who found fewer accidents in one factory over the ten years after the introduction of 12-hour shifts.

On absence, in a study of 19 companies, 5 reported a reduction in absenteeism (Broeders, 1989). An increase was found in only one company. Incidentally, quantitative data are not available concerning the size of the decrease.

"From research carried out by the Dutch Wages Department (1992) in 28 companies, no definite conclusions can be drawn. Absenteeism remains constant in 64% of the companies. Of the remaining companies, equal numbers report increases and decreases in absenteeism" (Hoekstra, Jansen & Van Goudoever, 1994).

Compressed working time, fatigue and health

The few pertinent studies have yielded divergent results, with unfavourable effects reported, for example, by Rosa (1993), and positive effects by Williamson et al. (1994). Our recent study of French customs officers shows that those on 12-hour shifts enjoy better health and sleep than their colleagues on 6-hour shifts (Gadbois and Prunier, 1994). In this case too, however, there are differences in the types of task performed. The importance

of the nature of the task is also emphasised by Rosa, who points to the greater arduousness of 12-hour shifts for those involved in physically demanding tasks.

Clearly, conclusions concerning the consequences of 12-hour shifts should not be formulated without considering the nature of the tasks performed. A valuable concrete illustration is provided by Ramaciotti et al. (1990) in their study of Geneva's public health department, which operates a waste water treatment plant and a household waste incinerator. In order to increase the frequency of time off at the weekend, the department's employees requested the implementation of 12-hour shifts from Friday night to Monday morning. This request was agreed. Upon implementation, workers at the round-the-clock incinerator found these shifts too tiring and soon abandoned the schedule. At the waste water treatment plant, whose operation is virtually uninterrupted, employees found the new work schedule to their liking and decided to keep it.

The repercussions of 12-hour shifts depend also on the personal situation of the shiftworkers. One good illustration is provided by the time spent travelling to work. Depending on the location of the workplace, travel time may be considerable, and hence encroach on sleeping time. A telling example of this is provided by the timetable (shown in Table 7.2) of a 2 x 10 hours shiftworker at the Talbot-Poissy car plant (considered in Chapter 3).

The influence of personal situations can be seen also in the case of the Bouhier foundry (considered in Chapter 3). The vote taken before the adoption of the new work schedule revealed varying degrees of interest for the compressed workweek:

– 20% of employees wanted to keep the old system,

– 65% accepted the new system with a formula of every other Saturday off,

– 15% accepted the new system with the Wednesday through Saturday schedule"

(Gadbois, 1994)

Fatigue and the length of the working day

How long can a working day last without negative effects on fatigue, health and productivity? The following emerges from the results of two studies at the Ministry of Transport, Public Works and Water Management and Schiphol Airport.

Employees with a longer working day (9 or 9.5 hours) do not display any clear differences in fitness compared to employees with an 8-hour working day.

At Schiphol Airport, research was also conducted into concentration. The results showed that concentration among employees with a compressed working week does not decrease at the end of the working day. Their concentration is no different from that of employees with an 8-hour working day.

Shifts of 9.5 hours were not appreciated by employees at Schiphol Airport.

A cautious conclusion on the effect of fatigue might therefore be that a working day can last 9 or 9.5 hours, but in the light of employees' experience, certain reservations are justified.

Table 7.2 : Timetable of a 2 x 10 hours shiftworker

One morning shift (6.15 a.m. to 4.29 p.m.) for two weeks	
3.50 a.m.	Waking
4.46 a.m.	Taken by company coach to railway station
5.24 a.m.	Departure of special works train
6.00 a.m.	Arrival at the factory
6.15 a.m.	Start of shift
7.50 a.m.	Break (10 minutes)
1 p.m.	Meal: 36 minutes
2 p.m.	Break (10 minutes)
4.29 p.m.	End of shift The worker has 21 minutes to: shower and change, and take the train, since there is no works train, and the ordinary train leaves at 4.50 p.m.
5.30 p.m.	Arrival of train in Paris Remaining journey home by bus, underground railway, or train
6 p.m. to 7 p.m.	Arrival home, depending on location
One evening shift (4.29 p.m. to 2.42 a.m.) for two weeks	
2 p.m.	Leaves home for station (journey by bus, and waiting time)
3.30 p.m.	Departure of special works train
4.00 p.m.	Arrival at the factory
4.29 a.m.	Start of shift
6.30 a.m.	Break (10 minutes)
7 p.m.	Meal: 36 minutes
11 p.m.	Break (10 minutes)
2.42 a.m.	End of shift
3 a.m.	Leaves factory by coach (or by private car if home is off the coach's route)

Source: Gadbois, 1994

The following factors can have an influence on the maximum length of the working day:

- health and age of employees;
- physical or mental demands of work;
- varied, as opposed to monotonous, work;
- travelling times for employees;
- obligations to household/family duties;
- adjustment to longer working day;
- daywork or shiftwork.

Participation and drop-out rate

In the case of the introduction of the compressed working week on a voluntary basis, an impression can be formed of factors which play a role in the decision to participate or not or to drop out.

The reasons why people stop working with the compressed week are:

– they have the impression that they are not finishing their work and/or that they are losing control of the working situation;

– the working day is felt to be too demanding from the point of view of fatigue;

– they feel there is a shortage of free time on working days.

Reasons for not participating in the compressed working week amount to roughly the same as reasons for dropping out. Another reason mentioned is that long travel times in combination with long working days seem to be too demanding.

The compressed working week is more successful among people without children, than among people who have children.

The compressed working week proves to be less popular among older employees (over 55).

Use of leisure time

The compressed working week can potentially affect the use of leisure time. On working days, there is less free time. On the other hand, people do have an extra day off.

"It can be said of appreciation for free time that the value of continuous blocks is greater than that of broken periods of leisure time. Appreciation of leisure time is greater when employees have a say about the rostering of leisure time with a corresponding increase in appreciation for the compressed working week" (Beckers, 1991).

Research conducted by Raaijmakers (1994) into the effects of the four-day working week on the use of leisure time reveals the following:

- there is hardly any difference between employees with a five-day working week and those with a four-day working week in terms of the number and nature of leisure activities;
- by comparison with employees with a five-day working week, the same activities are enjoyed more often among employees with a four-day working week.

"The same picture emerges in a study conducted at the Ministry of Transport, Public Works and Water Management. In addition, on the extra day off more time is devoted to do-it-yourself jobs and less to lazing about" (Hoekstra, Jansen & Van Goudoever, 1994).

Mobility

At the Ministry of Transport, Public Works and Water Management, the compressed working week was introduced (experimentally) against a background of, among other factors, a reduction in commuter traffic. A mobility study conducted there (ATOS, 1991) yielded results reported in detail in Hoekstra, Jansen & Van Goudoever (1994).

Table 7.3 : Distribution of activities for people with and without compressed working weeks (cww)

Activities	non-cww	cww	cww
	% ordinary leisure time	% ordinary leisure time	% time on extra day off
Study	8	7	6
Do-it-yourself jobs	11	12	22
Hobbies	17	16	14
Contacts with family	11	13	13
Household jobs	25	22	23
Lazing about	16	18	12
Various	13	12	10

The overall effect on mobility can be summarised as follows: no reduction in mobility, but a dispersion of mobility which can contribute to solving the traffic-jam problem.

There was also an evaluation at Schiphol Airport into the effects on mobility. The result showed a reduction in average travelling time of approximately 12 per cent.

Chapter 8 : CONCLUSIONS

The variety and, at first appearance, complexity of forms of compressed working time indicate several points.

The attractiveness of more clear days off

Creating work-free zones is a really attractive option for large numbers of employees in the modern world. For many leisure activities, a small chunk of time is fairly useless and a substantial break is much more attractive. Perhaps this trend also reflects the increasing use of technology in the home, so that the number of small daily chores and the amount of time they use has decreased.

So within many very different work situations and "shift systems" (in the broad sense of systems for scheduling employee attendance), the pressure is there for better periods of time off, and many brains have exercised themselves in trying to find appropriate solutions.

The changing nature of work

These changes, to longer periods at work that permit longer breaks away from work, are only really possible where the content of the work is not too physically or mentally demanding and intensive. In many industries, this is the result of the increasing use of sophisticated computers both to control the process and to display the state of the system to the operators.

It should not be forgotten that in a great many manufacturing and service situations, there is still a need for intensive operator intervention and work: in some ways, increasing computer control allows systems to monitor operator input, and provides the data for reorganisation to eliminate operators' breaks. The control of check-out operators in supermarkets is an obvious example of this.

The laws of the situation

Applying the insights from other people's experience to your own situation is never easy. The intention of a report like this is that you can, in a relatively short time, see many of the possibilities that may be or have been tried, and come more quickly towards what could be viable options for your own situation.

Hoekstra, Jansen & Van Goudoever (1994) conclude their contribution with useful recommendations for implementation, and a summary of critical factors for success.

Recommendations for implementation

During implementation of the compressed working week, both planning and introduction will have to receive adequate attention. If this is not the case, it can be expected that companies will fail to gain the potential benefits whilst still being faced with the undesirable effects.

Planning

When planning compressed working arrangements, choices will have to be made concerning, amongst others, the following:

- the length of the working day;
- the rostering of the day off;
- deployment of the workforce per day /week /month;
- which departments/positions will not be included;
- times for starting and finishing work;
- possible days for rostering consultation.

These choices will be partly determined by listing a number of "prior conditions".

External market factors

These factors are linked to prior conditions which are determined from outside the organisation:

- labour law: working conditions, Working Hours Act, Working Hours Decrees, permits;
- economic: selling market and purchasing market;
- labour market: recruitment position of the company;
- infrastructure: public transport, traffic jam problems.

Business/organisational factors

These factors are linked to the efficiency of the organisation. When planning working hour arrangements, the following should be borne in mind:

- consultation opportunities (internal and external);
- manageability of the department(s);
- attendance requirements (solo position);
- work in teams;
- possibilities for handover;
- jobs/positions linked to specific times;
- location of the work.

Personal factors

Problems which employees may consider important when planning a compressed working week are, for example, the length of the working day, times for starting and finishing work. In this respect, the age and health of employees should be borne in mind, along with the travelling distance for commuting employees and the home circumstances/household and family obligations. It is also possible to list the preferences, for example for the day off. In this case it is important to propose genuine options. If, for example, it is necessary to prevent everybody taking the Friday off, this option should be excluded.

Health factors

During planning, it will be necessary to bear in mind the physical or mental demands of the work (length of the working day, break arrangements). The final rota will also have to include a definite regularity and predictability.

Planning the introduction

Once a definitive plan has been drawn up, a number of administrative preparations will need to be made before introducing the new working hours arrangements:

- the establishment of rotas;
- holiday and sick leave registered in hours instead of days;
- making procedures clear for both internal and external contacts;
- ensuring that working hours are recorded in full;
- altering working conditions.

After introduction of the compressed working week, it makes sense to review the arrangements to check for desired and undesired effects so that adjustments can be made.

Critical success factors

The effects of the compressed working week vary. An important question must therefore be asked: what will bring about the success or failure of the compressed working week? (These success factors are taken from the Evaluation Study for the Ministry of Transport, Public Works and Water Management, 1991.)

Success and the design of the compressed working week

The success of the working hours arrangements is partly determined by the design and the way in which the arrangements are established. From the point of view of individuals, the following design factors are of importance:

- Being free regularly on a specific day off
  There is a marked preference for a fixed day off. Friday is by far the favourite.
- Good preparation with individual opportunities for employee choice
  With respect to the multitude of wishes concerning working hours which employees have, it is appreciated when preparation is thorough. This means providing enough opportunities for consultation.

From the point of view of the organisation, the following design factors are of importance:

- Adaptation of design to:
  - capacity requirement
  - possibility of introducing continuity in working processes
  - working hour arrangements of dependent associates

The introduction of the compressed working week is an organisational matter which needs to be tackled. It has emerged that the compressed working week works best if the administrative criteria stated here are met.

- Built-in flexibility

Rigid design of the compressed working week is not the most effective approach. For example, it should be possible to move the day off.

- Establishing limits for the purpose of manageability

An excessive number of different individual timetables increases organisational complexity to a considerable extent. A limitation of the number of alternatives can help here.

Success and individual employees

Two individual characteristics have proved to be of importance for the degree of success of the compressed working week.

- Younger employees
  Older employees participate in the compressed working week less when it is introduced on a voluntary basis. Fatigue would seem to play a role here.
- Not too many household and family responsibilities
  People who are responsible for these matters are less drawn to being away from home for 9 or 9.5 hours plus travelling time.

Success and the job

With certain job characteristics, the introduction of the compressed working week has proved somewhat easier.

- Not too much uniqueness in the job
  If there is a large degree of uniqueness, it is difficult to hand over work.
- Not too many dependent associates in the job
  If there is a high level of dependence, working hours of several people should be adapted to fit in with each other.
- Not too much unpredictability in the job
  Planning a day off is made a lot more difficult if the job is very unpredictable.
- Limited educational and training effort
  If employees follow courses 1 or 2 days a week, the remaining days acquire marginal significance.

Success and the organisation

On the organisational level, the following factors are of importance.

- Good support for management
  With the arrival of the new working hour arrangements, the organisation will be faced with changes which can be exploited to a varying extent. Examples of support are the establishment of rotas in which there is good monitoring of manning requirements, where there is accessibility of information and where there are solution-oriented responses to unexpected situations.
- Arrangements for job takeover and handover
  Continuity in working processes is best ensured when there are good agreements and facilities for job takeover and handover.
- Good manning
  When manning levels are stretched, there are felt to be more problems than when manning levels are adequate.

- Limited job differentiation
  If there is little job variation, it is easier to take over work.
- Low turbulence level
  When, for example, reorganisation is in progress, it is easier to introduce new working hour arrangements.
- Good system for recording working hours
  This allows for an increase in the manageability of differentiated attendance patterns.
- Being patient
  A period of adjustment is essential with the compressed working week. 'Teething troubles' are eliminated after this period of adjustment."

(Above sections taken wholesale from Hoekstra, Jansen & Van Goudoever (1994)

Finale

As a final word, it is worth keeping a record of what happens during the process, so that if a report similar to this is written, other people may learn from your experiences.

Good luck!

References

ATOS, Gecomprimeerde werkweek – Evaluatiestudie bij het Ministerie van Verkeer en Waterstaat (Compressed Working Week – Evaluation study at the Ministry of Transport, Public Works and Water Management), Amsterdam, 1991.

ATOS, Andere aankomst- en vertrektijden – Een studie naar de mogelijkheid van invoering van een gecomprimeerde werkweek bij de Luchthaven Schiphol. (Different arrival and departure times – A study on the possibility of introducing a compressed working week at Schiphol Airport), Amsterdam, 1992.

ATOS, Flexibiliseren door comprimeren – Evaluatiestudie gecomprimeerde werkweek NV Luchthaven Schiphol (Flexibility through compression – Study on the compressed working week at Schiphol Airport), Amsterdam, 1993.

Beckers, Th. A. M. (1991) *Tijd voor vrije tijd* (Time for leisure time), Catholic University of Brabant, Tilburg.

Bihl, G., Berghahn, A. and Theunert, M. (1993) Zukunftsorientierte Arbeitszeitgestaltung am Beispiel BMW Werk Regensburg. (Future-orientated working time arrangement on the example of BMW firm Regensburg). In: R. Marr (ed.): *Arbeitszeitmanagement* (Working time management), pp. 235-245, Schmidt, Berlin.

Broeders, P.A.M. (1989) Ervaringen met de gecomprimeerde werkweek in Nederland (Experience with the compressed working week in the Netherlands), Masters dissertation, Catholic University of Brabant.

Conrad-Betschart, H. (1990) Designing new shift schedules: Participation as a critical factor for an improvement. In: G. Costa, G. Cesana, K. Kogi and A. Wedderburn (eds.), *Shiftwork: health, sleep and performance*, pp. 277-282. (Peter Lang, Frankfurt am Main, Bern, New York, Paris)

Costa, G. (1994) *Compressed working time in Italy: some examples*. (Dublin: European Foundation for the Improvement of Living and Working Conditions)

Cullen, The Honourable Lord D. (1990) *The Public Inquiry into the Piper Alpha Disaster (Volumes One and Two*), London: HMSO for Department of Energy.

Dijen, J.W. van, Fraterman, A., Roon, P.M. van, Rooij, P.M. de & Schimmel, J.G.M. (1991) *Greep op Werktijden* (Grip on Working Hours), AWV/FME.

Fonderie Bouhier : Aménagement et durée du travail (Scheduling and duration of work at the Bouhier Foundry), *Liaisons sociales*: N° 7038, 27-5-1994.

Gadbois, C. (1981) Aides soignantes et infirmières de nuit. Conditions de travail et vie quotidienne (State enrolled and registered nurses on night duty. Working conditions and everyday life), Paris, ANACT, Coll. Etudes et recherches.

Gadbois, C. (1994) *Compressed working time*. (Dublin: European Foundation for the Improvement of Living and Working Conditions)

Gadbois, C. & Prunier, S. (1994) Douaniers en horaires atypiques: rythmes de vie et conditions de travail (Customs officers on unusual schedules: rhythms of life and working conditions). Rapport de recherche, 95 p., EPHE, Paris.

Hoekstra, F., Jansen, B. & Van Goudoever, B. (1994) *The compressed working week*. (Dublin: European Foundation for the Improvement of Living and Working Conditions)

Hoff, A., Knebel, H. and Schwedes, R. (eds.) (1993) Flexible Arbeitszeit (Flexible working time). Group 1, pp. 540, PdA 02, *Loseblatt Zeitschrift*, Freiburg.

Hoff, A., Knebel, H. and Schwedes, R. (eds.) (1994) Flexible Arbeitszeit (Flexible working time), Group 9.1, pp. 5, PdA 04, *Loseblatt Zeitschrift*, Freiburg.

Hoff, A. (1991) Paper at the seminar "Neue Schichtmodelle in Theorie und Praxis" (New shift models in theory and practice) in Karlsruhe, Germany, 11th November (unpublished).

Hoff, A. (1992) Paper at the seminar "Neue Schichtmodelle in Theorie und Praxis" (New shift models in theory and practice) in Berlin, Germany, 12th November (unpublished).

Jansen, B. & Mul, C. (1990) The Time Compensation Module System as an Alternative for the Compressed Working Week. In: G. Costa, G. Cesena, K. Kogi and A. Wedderburn (eds.), *Shiftwork: health, sleep and performance. (*Peter Lang, Frankfurt am Main, Bern, New York, Paris)

Kattenberg, P.A.P.E. (1990) *Een flexibele werkweek* (A flexible working week), Stichting Maatschappij en Onderneming.

Kelly, R.J. & Schneider, M.F. (1982) The twelve-hour shift revisited: recent trends in the electric power industry. In K. Kogi, T. Miura., H. Saito (eds.), *Shiftwork : its practice and improvement*, 369-384, Tokyo, Center for Academic Publications.

Knaupp, P. (1983) Die Zwölf-Stunden-Schicht. Eine Literatur Studie (The twelve-hour shift. A literature review), Rationalisierungs-Kuratorium der Deutschen Wirtschaft (RKW) e. V. (Hrsg.), Eschborn.

Knauth, P. (1993) The design of shift systems. *Ergonomics* 36, 15-28.

Knauth, P. & Hornberger, S. (1994) *Compressed working hours*. (Dublin: European Foundation for the Improvement of Living and Working Conditions)

Knauth, P. und Köster, D. (1990) Beurteilung von Krankenhaus-Dienstplänen aus arbeitswissenschaftlicher und arbeitsmedizinischer Sicht (An appraisal of hospital rosters from the ergonomic and industrial medicine perspective). In: F. Hofmann und U. Stössel (Hrsg.) *Arbeitsmedizin im Gesundheitsdienst*, Bd. 4, Gentner Verlag, Stuttgart.

Kogi, K., Ong, C.N. & Cabantog, C. (1989) Some social aspects of shiftwork in Asian developing countries. *International Journal of Industrial Ergonomics*, 4, 151-159.

Kutscher, J. (1994) Paper at the Seminar "Zeitgemäße Schichtpläne" (Time-appropriate shift plans) in Hannover, Germany 18th April (unpublished).

Lange, W.A.M. de (1989) *Configuratie van arbeid* (Configuration of labour), Thieme.

Laundry, B.R. & Lees, R.E.M. (1991) Industrial accident experience of one company on 8-hour and 12-hour shift systems. *Journal of Occupational Medicine*, 33, 903-906.

Léonard, R. (1994) *Compressed working time*. (Dublin: European Foundation for the Improvement of Living and Working Conditions)

Léonard, R. (1994) Teams of 12 hours at RBP Antwerp. *Orientations 11* (as yet unpublished).

Loontechnische Dienst (1992) Ervaringen met de vierdaagse werkweek (Experience with the four-day working week), The Hague, Ministry of Social Affairs and Employment.

Loskant (1970) (quoted in Münstermann und Preiser 1978) Der Einfluß verschiedener Schichtformen auf die Gesundheit und das Wohlbefinden des Wechselschichtarbeiters. (Influence of various shift forms on health and well-being of rotating-shift workers). In *Zentralblatt Arbeitsmedizin 20*, pp. 133-144.

Meggeneder, O. (1993) Einführung einer 12-Stunden-Schicht (Introduction of a 12-hour shift), *Z.Arb.wiss*. 47 (19NF), 108-115.

Münstermann, J. und Preiser, K. (1978) Schichtarbeit in der Bundesrepublik (Shiftwork in the Federal Republic of Germany). Humanisierung des Arbeitslebens. Forschungsbericht Nr. 8, Der Bundesminister für Arbeit und Sozialordnung, Bonn

Nachreiner, F., Frielingsdorf, R., Romahn, R., Knauth, P., Kuhlmann, W., Klimmer, F., Rutenfranz, J. und Werner, E. (1975) Schichtarbeit bei kontinuierlicher Produktion. Arbeitssoziologische, sozial-psychologische, arbeitspsychologische und arbeitsmedizinische Aspekte (Shiftwork in the context of continuous production. Perspectives from the fields of industrial sociology, social psychology, occupational psychology and industrial medicine), Forschungs-bericht der Bundesanstalt für Arbeitsschutz und Unfallforschung Dortmund, Nr. 141, Westdeutscher Verlag, Opladen.

Ong, C. N. and Kogi, K. (1990) Shiftwork in developing countries: Current issues and trends. In: A.J. Scott (ed.), *Shiftwork*, pp. 417-428, Hanley and Belfus, Philadelphia.

Parkes, K.R. (1993) *Human factors, shift work and alertness in the offshore oil industry*. (London: HMSO)

Poor, R. (ed.) (1970) *4 days, 40 hours*. Bursk & Poor, Cambridge, Mass.

Raaijmakers, S. (1994) De vierdaagse werkweek. Arbeid, zorg en vrije tijd (The four-day working week. Labour, care and leisure time), to be published, Tilburg.

Ramaciotti, D., Blaire, S., Bousquet, A., Conne, E., Gonik, V., Ollagnier, E., Zimmerman, C. & Zoganas, L.(1990) Processus de régulation des contraintes économiques, physiologiques et sociales pour différents groupes de travailleurs en horaires irréguliers et de nuit (Regulatory behaviors of shift-workers regarding economic, physiological and social strain). *Le Travail Humain*, 53, 3, 193-212.

Rosa, R.R. (1991) Performance, alertness and sleep after 3-5 years of 12 h shifts : a follow-up study. *Work and stress*, 5, 2, 107-116.

Rosa, R.R. & Bonnet, M.H. (1993) Performance and alertness on 8 h and 12 h rotating shifts at a natural gas utility. *Ergonomics*, 36, 10, 1177-1193.

Slaven, G.M., Flin, R.F. & Mearns, K. (1995) Shiftwork and rotation schedules in the UK oil industry: a review. Paper presented at 12th International Symposium on Night and Shift Work: Connecticut, USA, 13-18 June 1995.

Talbot-Poissy, Réorganisation du temps de travail (Reorganisation of working hours at Talbot-Poissy). *Liaisons sociales* : N° 6894, 11-8-1993.

Talbot-Poissy, Semaine de travail de 4 jours (accord du 29 Octobre 1990) (The 4-day week at Talbot Poissy (as agreed at 29th October 1990)). *Liaisons sociales*: N° 6456, 29-11-1990.

Tepas, D.I. (1985) Flexitime, compressed workweeks and other alternative work schedules. In: S. Folkard and T. Monk (eds.), *Hours of work. Temporal factors in work-scheduling*, pp. 47-164. (John Wiley and Sons, Chichester, New York, Brisbane, Toronto and Singapore)

Tepas, D.I. (1990) Condensed working hours : questions and issues. In G. Costa, G. Cesana, K. Kogi and A. Wedderburn (eds)., *Shiftwork: health, sleep and performance*, pp. 271-276. (Peter Lang, Frankfurt am Main, Bern, New York, Paris)

Todd, C., Reid, N. & Robinson, G. (1989) The quality of nursing care on wards working eight and twelve hour shifts: a repeated measures study using the MONITOR Index of quality care. *International Journal of Nursing Studies*, 26, 4, 359-368.

Tsaneva, N., Nicolova, R., Topalova, M. and Danev, S. (1990) Changes in the organism of shift workers operating a day and night 12 hour schedule in carbon disulfide production. In: G. Costa, G. Cesana, K. Kogi and A. Wedderburn (eds.), *Shiftwork: health, sleep and performance*, pp. 324-329. (Peter Lang, Frankfurt am Main, Bern, New York, Paris)

Wallace, M. (1989) The 3 day week: 12 hour shifts. In: M. Wallace (ed.), *Managing shiftwork,* pp. 49-56. Brain-Behaviour Research Institute, Department of Psychology, La Trobe University, Bundoora, Australia

Weidinger, M. (1992) Paper at the Seminar “Neue Schichtmodelle in Theorie und Praxis” (New shift models in the theory and practice) in Berlin, Germany 12th November (unpublished).

Williamson, A. M., Gower, C.G.I., and Clarke, B.C. (1994) Changing the hours of shiftwork: a comparison of 8 h and 12 hour shift rosters in a group of computer operators. *Ergonomics*, 37, 2, 287-298, 1994.

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