Book review

• *Proceedings of the Symposium on Face-end Technology.* London, Institution of Mining Engineers, 1981. £25 per copy (members), £30 per copy (non-members) including postage.

Reviewer: B.C. Alberts

This book includes the papers presented at the Symposium, which was held in Harrogate, England, in December 1980.

(1) Total face-end systems I: the face-end in focus by C.W. Turner

The need for longwall advancing as a system will remain, and in thicker seams results can compare with retreat methods. Improved machine performances have highlighted the need for better efficiency at face ends in order to

(a) ensure that the turn-round time of power loaders is kept to a minimum,
(b) eliminate the need to work on the face side of the AFC, on the face line, and in stables, and
(c) totally dispose of roadway formation dirt into the gate side packs with the minimum of physical effort.

There are many techniques to fulfil these objectives, but success depends on the compatibility of the equipment and carefully planned integration within the system. A series of trials using various machines was conducted in the south Yorkshire area in a range of seams of 0,9 to 1,5 m. The object of the trials was to gain experience in the planned integration of a variety of manufacturers' equipment. Some 40 faces were used in the trials, and three recent installations are commented on in detail.

(2) Total face-end systems II by E. Mitchell

Following the drive for mechanization in the 1950s and the successful emergence of machines such as the Trepanner and Shearer, the need for efficient face-end systems was quickly reflected in face-delay studies. Considerable investment was made on the development of stable elimination and ripping machinery.

The paper describes two systems in detail relating to a retreat face method of working re-using an existing gate end to an advance face method of working using three shearers to eliminate the stables and ripping. The introduction of these elimination methods resulted in a decline in the number of advanced headings in the north Yorkshire area.

(3) Total face-end systems III by J.T. Nicholson

The Deep Soft Seam at Shirebrook, lying at a depth of 691 m, has been worked since 1955. It has always been a difficult seam, having a high roadway closure rate, high CH_4 emission, and a liability to spontaneous combustion. The difficulty of maintaining advance with the conventional stable holes and ripping system was causing concern, as were the less than desirable gate conditions. Attempts to use stable elimination methods to improve face-end conditions failed because of the soft nature of the floor and floor lift, up to 3,04 m.

The paper describes a system of working using an in-web shearer and forming the roadways some 10 to 15 m behind the face. Transportation being a problem due to floor lift, the system demonstrated the simple integration of coal-getting and transportation whilst maintaining flexibility in forming the roadways behind the face.

(4) Total face-end systems IV: improving face-end techniques by F. Middleton

More reliable coal-cutting machines, powered supports, and armoured face conveyors demonstrated the need for more reliable face-end systems. The paper describes face-end systems introduced in the north Nottinghamshire area to improve performance on longwall advancing faces in seams 1,20 m and below. Some of the systems that were considered to have potential include advanced headings, roadhead dinting as an alternative to ripping, and in-line ripping. Hand packing, cam packing, and low-pressure stowing are discussed.

The advanced heading system at the maingate end of faces in thinner seams proved to be successful, but roadway deformation remains one of the major problems.

(5) The effect of mechanization on strata control at face-ends by Horace Stokes and Frank Kitching

The changes in face-end layout resulting from the introduction of mechanization at the coalface are identified, and the effects of the changes in techniques and systems on strata control at face-ends are considered.

The effect of the mechanized ripping and profiling of roadways on roadway stability are compared, along with an examination of the current size, shape, and strength of permanent supports. Mention is made of the problems associated with the mechanization of arch lifting and setting.

A detailed examination is given of the functions of roadside packs and the effect of the packing system on face-end layout and roof control. Packing systems designed to allow roadways to be used more than once are considered.

The paper describes systems associated with successful advancing faces in terms of productivity and roadway stability.

(6) The environment at the face-end by R.A. Swift

The environmental control at the face-end is usually more complicated than elsewhere underground, and detailed attention to the relevant factor in planning and design, as well as the maintenance of high operational standards, is necessary to counter the effects o methane as well as other gases, dust, heat, and noise. Mining at greater depths has accentuated the needs to counter these pollutants. At the same time the paper stresses that there must be no lowering of standards, either operational or by legislation, in order to achieve the high face performance required.

(7) Some aspects of safety, law and practice relating to longwall face-ends by J.S. Wilcox

The paper reviews the accident experience and potential hazards related to face-ends in longwall-mining systems. Accidents resulting from falls of ground and face are highlighted. The origin and reasons for existing legislation relating to the support of face-ends is discussed, and the effect on overall production efficiency related to this legislation. It is reasoned that sound practical considerations will indicate elements of high accident frequency and assist in their reduction. Comment is made on future design features of face-ends and support systems.

(8) Engineering aspects of face-end work by B. King

The paper discusses engineering aspects of some fifty longwall installations in the Western Area of the National Coal Board. The engineering involvement from the basic initial design, the mock-up on surface, followed by underground installation, and testing and commissioning, is detailed. Efforts made to increase the power input whilst reducing the overall size of the equipment indicate the engineering involvement in face-end operation, and the idea of standard equipment against 'use of' layouts is explored along with the ability of Stores Departments and Plant Pools to deliver the necessary items.

(9) Development of equipment in the face-end area by H. Glasby and J.J. Graham

The activity at the face-end is more complicated and confined than that along the face, and it is recognized that this area can be a limiting factor in the overall face operation.

Equipment employed at the face-end can be categorized as face machines, roadway formation and packing machines, armoured face conveyor and stageloader, and roof supports. The user and manufacturer need to cooperate in keeping design as simple as possible yet sufficiently robust to ensure reliable operation, and manufactureres may have to join in offering integrated equipment as a 'package deal' to the user. The selection of equipment for face-ends is influenced by seam thickness, the method of face working, and the nature of the roof and floor strata.

(10) Computer-aided design of face-ends by K. Moore

A computerized technique for the design of face-end layouts is described, along with the use of computerized graphics to assemble combinations of equipment in any proposed layout, enabling a check to be made on the compatibility.

A study of the potential productivity of any system can be evaluated, and this is an aid in the selection of the best system for a particular installation. The paper describes how the face-end technology must be combined with the face working so that the full face potential can be realized. The future application of computerization is also discussed.

(11) Face-end performance by D. Barrister, S. Jenkins, and I.J. Watson

The reasons for face-end mechanization are discussed, and the results obtained in the past decade summarized. Efforts to reduce the manual work involved and the number of face-end jobs, along with an increase in the rate of advance and thus in output and improved safety, are described.

The increase in stable elimination, the use of mechanized packing and mechanization of rippings and the effect on face advance, with a case made out for retreat mining, are discussed fully.

Corrigenda: December 1981

The following corrections should be made to pages 346 and 347 of the December 1981 issue (vol. 81, no. 12) in the paper by O. L. Papendorf entitled 'A note on rapid determinations of present values in the presence of growth and inflation'.

(1) Equation (2) on page 346 should read as follows:

$$\left[(1+\lambda_1)\sigma_1+(1+\lambda_1)^{n1}\left\{(1+\lambda_2)\sigma_2+(1+\lambda_2)^{n2}(1+\lambda_3)\sigma_3\right\}\right] \quad (2)$$

(2) Table II should read as follows:

TABLE II

PROGRAM FOR HEWLETT 41C COMPUTER

01 LBL "Modpv"	53 /	105 +	157 STO 16
02 0	54 1	106 RCL 12	158 GTO 23
03 STO 19	55 +	107 1	159 LBL 24
04 LBL A	56 STO 08	108 –	160 RCL 02
05 FIX 3	57 "I=?"	109 CHS	161 STO 17
06 "N1=?"	58 PROMPT	110 /	162 GTO 25
07 PROMPT	59 100	111 STO 15	163 LBL 25
08 STO 00	60 /	112 XEQ 21	164 RCL 17
09 "N2=?"	61 1	113 LBL 21	165 RCL 14
10 PROMPT	62 +	114 RCL 13	166 *
11 STO 01	63 STO 09	115 1	167 RCL 13
12 "N3=?"	64 "K=?"	116 X<>Y	168 ENTER↑
13 PROMPT	65 PROMPT	117 X=Y?	169 RCL 10
14 STO 02	66 STO 10	118 XEQ 22	170 Y↑X
15 "G1=?"	67 "D=?"	119 ENTER↑	171 *
16 PROMPT	68 PROMPT	120 RCL 01	172 RCL 16
17 100	69 STO 11	121 Y↑X	173 RCL 13
18 /	70 'R0=?"	122 CHS	174 *
19 1	71 PROMPT	123 1	175 +
20 +	72 100	124 +	176 RCL 12
21 STO 03	73 /	125 RCL 13	177 Enter↑
22 "G2=?"	74 1	126 1	178 RCL 00
23 PROMPT	75 +	127 –	179 Y↑X
24 100	76 STO 26	128 CHS	180 *
25 /	77 RCL 03	129 /	181 RCL 15
26 1	78 RCL 06	130 STO 16	182 RCL 12
27 +	79 *	131 XEQ 23	183 *
28 STO 04	80 RCL 09	132 LBL 23	184 +
29 "G3=?"	81 /	133 RCL 14	185 RCL 10
30 PROMPT	82 STO 12	134 1	186 *
31 100	83 RCL 04	135 X<>Y	187 RCL 03
32 /	84 RCL 07	136 X=Y?	188 /
33 1	85 *	137 XEQ 24	189 RCL 09
34 +	86 RCL 09	138 ENTER↑	190 ENTER↑
35 STO 05	87 /	139 RCL 02	191 RCL 11
36 "R1=?"	88 STO 13	140 Y↑X	192 Y↑X
37 PROMPT	89 RCL 05	141 CHS	193 /
38 100	90 RCL 08	142 1	194 RCL 26
39 /	91 *	143 +	195 ENTER↑
40 1	92 RCL 09	144 RCL 14	196 RCL 11
41 +	93 /	145 1	197 Y↑X
42 STO 06	94 STO 14	146 –	198 *
43 "R2=?"	95 RCL 12	147 CHS	199 STO 18
44 PROMPT	96 1	148 /	200 ARCL X
45 100	97 X<>Y	149 STO 17	201 VIEW 18
46 /	98 X=Y?	150 XEQ 25	202 STOP
47 1	99 XEQ 20	151 LBL 20	203 RCL 18
48 +	100 ENTER↑	152 RCL 00	204 ST + 19
49 STO 07	101 RCL 00	153 STO 15	205 VIEW 19
50 "R3=?"	102 Y↑X	154 GTO 21	206 STOP
51 PROMPT	103 CHS	155 LBL 22	207 GTO A
52 100	104 1	156 RCL 01	208 END