WASC 2257

List of titles of reports on RDX

27-6-1997

RDX

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THE HISTORY, ROLE AND ORGANISATION OF THE EXPLOSIVES RESEARCH AND DEVELOPMENT ESTABLISHMENT, WALTHAM ABBEY, ESSEX

1 HISTORY

1 1 Early history

ERDE is the central chemical research establishment of the Procurement Executive Ministry of Defence. This position stems from its history as a gunpowder mill, established on the River Lea at Waltham Abbey in the middle of the seventeenth century. The mill passed into public ownership as the Royal Gun Powder Factory in 1787, under the direction of General Sir William Congreve, whose son of the same name is remembered as the moving spirit behind the British Land Service and Naval Rocket Brigades of the Napoleonic era and afterwards. As the Royal Gunpowder Factory, the Establishment saw what must be one of the earliest applications of Quality Assurance in the Ordnance field: under Sir William, it soon acquired an unrivalled reputation for the quality of its powder. This was achieved at considerably lower unit cost than before nationalisation, so that the Mills, as they have continued to be called locally, may be said to have anticipated the Rayner reforms by some 200 years!

1 2 Middle nineteenth and early twentieth centuries

Single and double-base propellants and their ingredients nitrocellulose and nitroglycerine were first produced for the British Service at Waltham Abbey - indeed until 1915 it remained the only source of cordite in the country. The manufacture of gunpowder continued side-by-side with that of more modern explosives and propellants until the Second World War, when German bombing brought production to a halt.

1 3 Post-war history

At the end of the Second World War the site was largely derelict and might have remained so but for a decision to transfer much of the work of the Research Department of the Royal Arsenal at Woolwich progressively to Waltham Abbey where the name Explosives Research and Development Establishment was adopted. Old buildings were renovated as laboratories, and process areas up-dated. Since these early days, new buildings and facilities have been added. Three major items from Royal Gun Powder Factory days have been preserved: a millstone from an edge runner incorporating mill (displayed at the Main Gate entrance to the North Site), a gunpowder barge used for transport of powder within the Factory (beached opposite the North Site boilerhouse) and a narrow gauge powder wagon, propelled by hand or as part of a train drawn by an oil-fired locomotive (mounted opposite the entrance to the Library and Lecture Theatre building in North Site). Walton House, also on North Site, was the residence of the family which owned the mills before nationalisation: it houses a small historical collection associating the names of Congreve, Henry Cavendish, Benjamin Count Rumford, Sir Joseph Banks PRS and Michael Farraday (he spells his name thus) with the Factory.

1 4 Expansion

Since it was founded in its present form, the Establishment's function as an explosives R & D Organisation has been extended to cover solid propellants for rockets and non-metallic materials for use in Ordnance where the proximity of explosives and propellants constitutes a particularly exacting environment. Non-metallic materials work embraces the study of ultra-stiff materials which are attractive to the designer of such Ordnance stores as guided and free-flight weapons.

2 RELATIONSHIPS WITH OUTSIDE ORGANISATIONS

2 1 Relationships with Procurement Executive as a whole and with industry

ERDE is a joint Directorate with the Rocket Propulsion Establishment at Westcott, near Aylesbury in Buckinghamshire. Formal relationships with the remainder of Procurement Executive and especially with Quality Assurance and Ordnance Branches are shown at figure 1. The pecked lines show the routes by which technical contact is maintained at the working level. In the Ordnance field, ERDE has close relationships with Nobel's Explosives Company Ltd, with Summerfield Research Station (operated by Imperial Metal Industries Ltd) and looser relationships with the Martin Baker Company Ltd and IMI Kynoch Ltd. As integration with RPE is implemented, relationships with Bristol Aerojet Ltd are becoming closer.

2 2 Relationships with overseas organisations

In addition to maintaining close and continuing relationships with the Defence Departments of many overseas countries, commercial agreements exist for the manufacture under licence of initiating explosive compositions in the RD1300 series in Canada, the Indian sub-continent, Sweden and the USA. In the field of strong fibres (used in the production of the ultra-stiff materials previously mentioned), ERDE processes are operated in Finland and Switzerland (the latter suspended for the time being). In a recent package deal, ERDE and RPE have been involved with Bristol Aerojet Ltd in supplying plant and "know-how" to INTA in Spain for the manufacture and filling of plastic (solid) rocket propellant for sounding rockets.

3 ORGANISATION AND ACTIVITIES

3 1 General

Figure 2 shows the organisation of ERDE. The Director, Dr L J Bellamy CBE, who is responsible for this Establishment and for RPE, is a world authority on infra-red spectroscopy, a technique which has been at least partly responsible for many advances in our knowledge of the structure of non-metals and thus for the emergence since the mid-1930s of a plethora of new fibres, paints, plastics and rubbers. Dr Bellamy's Deputy at ERDE is Mr G K Adams who has specialised in the study of the complicated reactions involved in explosions and in propellant burning. Dr Young, Deputy Director 1 at Westcott, a specialist in the formulation and life-testing of solid propellants, is in charge of Research there, while Mr R Heron, Deputy Director 2, covers Development and is also Head of the Rocket Motor Executive. Administrative and engineering support at ERDE are the respective responsibilities of the Administrative Branch under Mr S F M Whiteside and the Engineering Facilities Branch under Mr R Fisher. The role of the Establishment is fulfilled directly through six functional Branches, described below.

3 2 Explosives branch

This Branch is headed by Dr C A Beck and is divided into six sections as follows. Explosive Compositions under Mr F H Doe formulates new compositions and products for specific applications. Explosives Performance under Mr S J Hawkins evaluates new compositions as explosives and advises on explosive effects, while Initiating Explosives under Dr R McGuchan develops new compositions to replace existing formulations which, in spite of intensive development since the Second World War, still possess some undesirable features. Sensitiveness and Hazards 1 Section under Dr R M H Wyatt studies and advises on general hazards associated with explosives while Section 2 under Dr K N Bascombe is responsible for the study of some aspects of hazards associated with rocket and gun propellants: both of these sections classify candidate materials according to the hazards associated with their manufacture and use. Finally, the Woolwich Section under Mr K J Holloway operates pilot scale and intermediate scale plant for the production of initiating explosives developed at ERDE.

3 3 General chemistry branch

Under Dr A R Osborn, this branch provides a wide range of specialist services grouped as below. Compatibility and Stability section headed by Mr N J Blay studies the sensitising effect of a wide range of materials of construction on the thermal stability of explosives and propellants. Crystallography, with Mr J R C Duke in charge, studies the crystalline forms in which explosives and propellants ingredients can exist; the form can have an important bearing on the functioning of ingredients in compositions. General Analysis under Mr E J Gallacher apply a wide range of sensitive analytical techniques, mainly in connection with the determination of stabilisers and their degradation products in propellants. The Glassworking section lead by Mr R Watkins, undertakes laboratory glassblowing and glass engineering for the small-scale production of chemicals etc. Mr D A G Eldridge heads the group combining glassworking, electronic and mechanical engineering, the two last being under the supervision of Messrs D H L Mansell and R I Cracknell respectively. Library and Information Services (Mr M McLaren) and Mathematics and Computing Sections provide the services named and the muster of sections in this branch is completed by Physical Chemistry under Dr L Phillips studying the mechanisms by which explosives and propellants degrade under storage conditions.

3 4 Non-metallic materials branch

Under the supervision of Dr B L Hollingsworth, this branch comproses the following sections. Composites Design and Applications lead by Mr N J Parratt is concerned with composite materials using very stiff reinforcement such as discontinuous carbon fibres and carefull graded and aligned asbestos fibres. Polymer Assessment (Dr A Davis) deals with the characterisation of the mechanical properties and durability of polymeric materials (plastics, rubbers etc) while in Polymer Chemistry section, led by Dr D H Richards, speciality polymers of potentially high performance are synthesised. Such materials may find widespread use in Defence equipment in future. Polymer Development and Applications section under Dr D Sims, undertakes the design and in many cases, serial production of, plastics and rubber components for Service equipment. Finally, Polymer Characterisation lead by Dr A V Cunliffe operates sophisticated instruments for the determination of polymer structure: such structure can critically determine the fitness of a polymer for a given application.

3 5 Process research branch

Mr L E Dingle has charge of this branch which is divided into three functional sections. Chemical Engineering 1, led by Dr A W H Pryde, develops to pilot plant scale, processes for the production of explosives and propellant ingredients, and optimises existing processes. Chemical Engineering 2 (Dr C C Evans) has similar responsibilities for polymers, fibres and ceramics while Preparative Chemistry Section under Dr G F Hayes is concerned with the laboratory scale study of processes for the production of explosives and propellant ingredients and of certain polymeric materials. The Thermophysical Properties Group under Mr H Ziebland is a lodger group reporting to the National Physical Laboratory (Department of Industry) and operates the British Calibration Service for thermal measurements.

3 6 Propellants 1 branch

This branch, headed by Dr S W Bell, deals with propellants based on nitrocellulose. It is divided into five functional sections, three of which relate to the principal methods of manufacture. "C" (Cast Double Base) section under Mr R P Ayerst works on propellants formed by introducing a liquid (usually containing nitroclycerine) into moulds filled with nitrocellulose granules which swell and consolidate under the action of gentle heating to fill the mould and reproduce its shape. "E" (Extruded Cordite) section under Mr E A Baker, develops charges formed by extrusion from blanks cut from sheet prepared by mixing and rolling the ingredients. "G" (Gun Propellants) section (Mr R A Wallace) develops propellant made from nitrocellulose fabricated when gelatinised by solvents and combustible charge containers for large calibre ordnance.

All three propellant types find wide application in the Service and ERDE is intimately involved in (and indeed, in many cases, is ultimately responsible for) everything from composition selection and early manufacture through to post-design services even although full development and production may be elsewhere. In "L" section under Dr T J Lewis, a small team works on the development of a propellant and charge design for the Light Antitank Weapon (LAW): Dr Lewis also leads our research on nitrocellulose propellants, notably that on the structure and behaviour of nitrocellulose itself. "B" (Ballistic Assessment) section under Mr G W Stocks provides services to the remainder of the branch and to other parts of ERDE in measuring the ballistic properties of propellants and small rocket motors.

3 7 Propellants 2 branch

Mr P R Freeman leads this branch, which is divided into three sections. The first of these, Adhesion and Rheology headed by Mr W A Dukes, is concerned inter alia with structural adhesives which are finding increased use in ordnance together with sealants which are already widely used in that field and with the study of the long-term flow properties of solid propellants and their response to the fast-acting forces arising on pressurisation and projection. A further field of investigation covered by this section has been the adhesion of shell fillings to case walls. Failures can occur as a result of the migration of additives to the filling/wall interface and of the thermal contraction arising as the charge cools after filling. The plastic propellant section under Dr J A Hicks formulates, develops and tests this class of propellant which consists of an oxidiser (fine ammonium perchlorate powder) incorporated into a very viscous matrix of poly-iso-butylene or polyisoprene and filled into rocket motor cases (sometimes at somewhat elevated temperatures). This propellant, which has already been mentioned as having been sold to Spain as a package deal, is the cheapest available: it has a very wide temperature range of satisfactory operation and is capable of giving very high burning rates, a desirable feature in a propellant for an unguided rocket. The Rubbery Propellants section under Mr G J Spickernell develops composite propellants in which the ammonium perchlorate oxidiser is bound by a matrix made from a liquid rubber prepolymer which, on mixing with a crosslinking agent at room temperature, is a mobile liquid easily cast into moulds with complex profiles and cured to a rubbery mass by gentle heating. The method is clearly attractive, but the chemistry of crosslinking (curing) and of storage stability is still far from clear and much work is therefore being done here and overseas to elucidate it. Rubbery propellant is also a candidate for LAW and propellant and charge design are being developed in parallel with the double base propellant mentioned above.

4 CONCLUSION

This brief account has necessarily glossed over a number of aspects of our work, in particular the advisory role of the Establishment towards Defence branches, establishments and contracts in its field of expertise. Those seeking further information should approach the officers named (their telephone extensions are given on Figure 2) or the Technical Training Officer, Mr D Gordon, extension 233, who is responsible for coordinating visits to the establishment.

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Procurement Executive
Ministry of Defence
Powdermill Lane
WALTHAM ABBEY Essex EN9 1BP

tel Lea Valley (9 from London, 0992 in UK) 713030
telex 267455 (tel addr ERDE WALTHABBEY)

March 1976

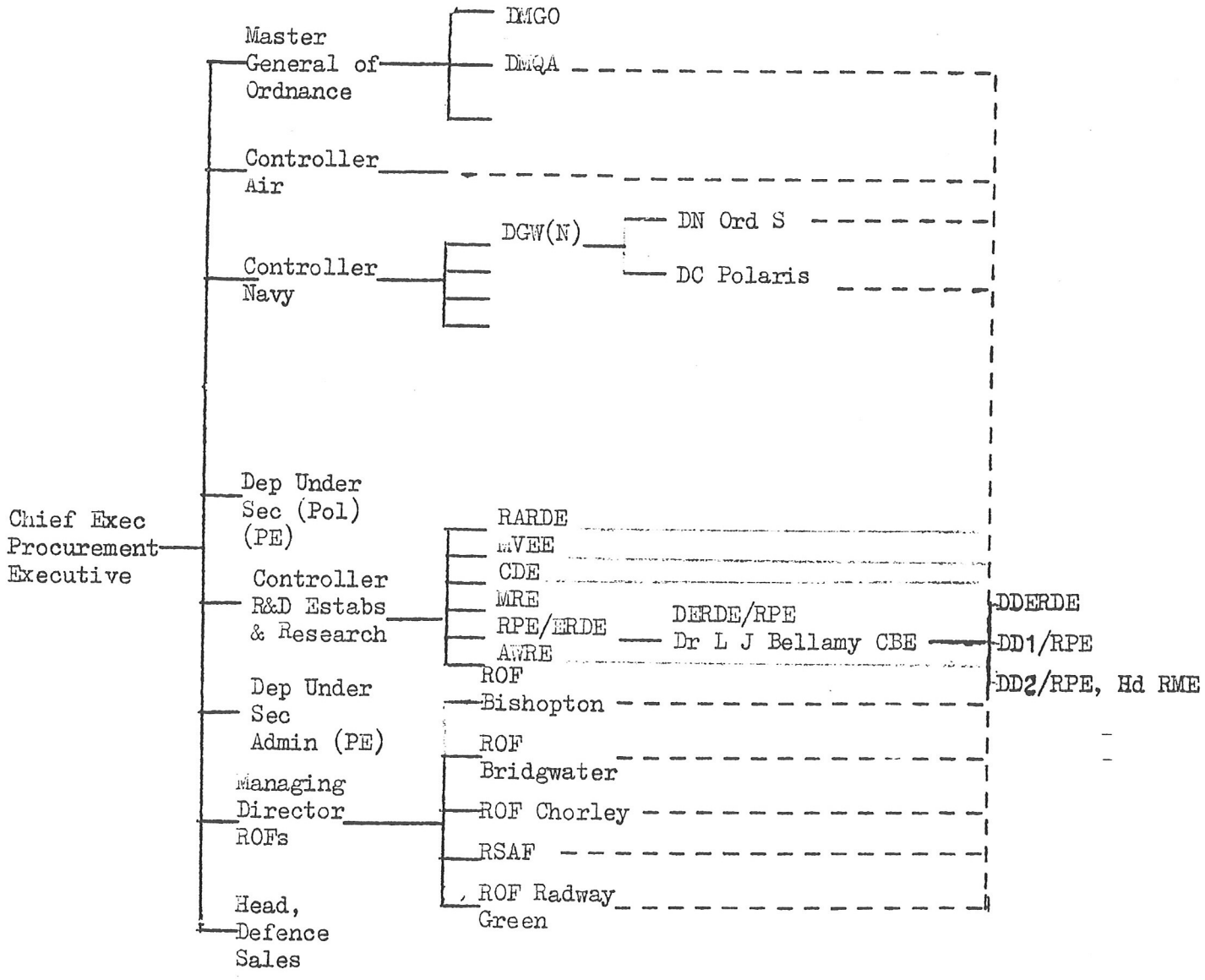

FIGURE 1 - RELATIONSHIPS BETWEEN ERDE/RPE AND THE REMAINDER OF PROCUREMENT EXECUTIVE

WAC 2/06 1 3 76 p6

(Safety Officer J V Griffiths PSO 229) DIRECTOR Dr L J Bellamy US 203 (Tech Asst D Gordon SSO 233)
(Sy Officer Capt E A Burt RN(Rtd) 580) DEP DIRECTOR G K Adams DCSO 413 (Tech Asst A S Smith PSO 518)

		Sec	Section name	Section leader, grade and tel no(s)
Explosives Dr C A Beck 306 SPSO		EC	Explosive compositions	F H Doe SSO 562 433
		EP	Explosives performance	S J Hawkins PSO 525 436 439
		IE	Initiating explosives	Dr R McGuchan PSO 210 523
		SH1	Sensitiveness & hazards 1	Dr R M H Wyatt PSO 322 307
		SH2	Sensitiveness & hazards 2	Dr K N Bascombe PSO 307 322
		WS	Woolwich section	K J Holloway PSO 84237 84239
General Chemistry Dr A R Osborn 346 SPSO		CR	Crystallography	J R C Duke SSO 305
		CS	Compatibility & stability	N J Blay PSO 237
		EI	Electronic instrumentation	D H L Mansell SSO* 348
		GA	General analysis	E J Gallacher SSO 494 311 236
		GW	Glassworking	R Watkins*† 349
		LI	Library and information	M McLaren SSO 256 235
		MC	Mathematics and computing	M Bergh†SO 396
		MI	Mechanical instrumentation	R I Cracknell HSO* 348
		PC	Physical chemistry	Dr L Phillips PSO 276 409 547
Non-metallic Materials Dr BL Hollingsworth†		CD	Composite development and and applications	N J Parratt PSO 597 411 390
		PA	Polymer assessment	Dr A Davis PSO 382
		PC	Polymer chemistry	Dr D H Richards SPSO(SM) 480
		PD	Polymer development and applications	Dr D Sims PSO 590
		PM	Polymer morphology	Dr B J MacNulty SSO 430
		PX	Polymer characterisation	Dr A V Cunliffe SSO 462 458 †SPSO
Process Research LE Dinglet†		CE1	Chemical engineering 1 (expl & propts ingredients)	Dr A W H Pryde SPSO(SM) 351 268 316 593
		CE2	Chemical engineering 2 (polymers fibres ceramics)	Dr C C Evans PSO 415 411 347
		PC	Preparative chemistry	Dr G F Hayes PSO 423 †SPSO
Propellants 1 Dr S W Bell 319 SPSO		B	Ballistic assessment	G W Stocks PSO 291
		C	Cast double base (CDB) propellants	R P Ayerst PSO 545
		E	Extruded propellants	E A Baker SSO 469
		G	Gun propellants	R A Wallace PSO 381
		L	Laboratory services	Dr T J Lewis PSO 202
Propellants 2 P R Freeman 414 SPSO		AR	Adhesion and rheology	W A Dukes PSO 463
		PP	Plastic propellants	Dr J A Hicks PSO 487
		RP	Rubbery propellants	G J Spickernell PSO 301
Engineering2 Facilities 4P R Fisher CE2		MS	Machine shops	R P Clarke PTO1 596 283
		DO	Design offices	H C Turner PTO1 435
Dep CE J M Davies PTO1 330		BWD: building works dep		J E Brown PTO2 279
		ES: elec services dep		M D Hicks PTO2 524 263
		MS: mech services dep		F H Mills PTO2 582 564
Administration S F M White-side Prin 300	Sen Admin Off S G Lock SEO 338	AO/G General) admin officer		A J Eley HEO 378
		AO/P Personnel)		G E Chapman HEO 334
		AO/S Stores)		J C Turner HEO 336

*reports to D A G Eldridge PSO 522 †in charge in absence of designated Sec Ldr

FIGURE 2 - LINE MANAGEMENT CHART FOR THE EXPLOSIVES RESEARCH & DEVELOPMENT ESTABLISHMENT

00009
0000970 R 47856
JAMIESON V WILBY J
ROYAL ARMAMENT RESEARCH AND DEVELOPMENT ESTABLISHMENT FORT HALSTEAD
THE MANUFACTURE OF AN RDX BASED EXPLOSIVE SHEET
MEMO MX 34 62
1962
662.2 RDX
RESTRICTED

00027
0004949 ARCHIVES
BELL J A SALTER D A
PROPELLANTS EXPLOSIVES AND ROCKET MOTOR ESTABLISHMENT WALTHAM ABBEY
PREPARATION OF HMX
TR 68
1987
662.2 HMX
UK RESTRICTED

00073
0011195
ROBERTS C M
ROYAL ORDNANCE AMMUNITION DIVISION BRIDGWATER
REPORT OF INVESTIGATIONS INTO THE MANUFACTURE OF HIGH RDX COMPOSITIONS AT RO BRIDGWATER
BW 3483 MISC2 29
1992
662.2

00086
0012263 9
BAWN C E H HAY J K POLLARD F H
GLOUCESTERSHIRE BRANCH RESEARCH DEPARTMENT WOOLWICH
UNIVERSITY OF BRISTOL
THERMAL DECOMPOSITION OF TETRYL AND RDX
BRIST 43
1942

00089
0012274 18
ADAMS G K
GLOUCESTERSHIRE BRANCH ARMAMENT RESEARCH DEPARTMENT
WOOLWICH UNIVERSITY OF
BRISTOL
THERMAL DECOMPOSITION OF RDX
BRIST 116
1944

00092
0012281 25
ARMAMENT RESEARCH ESTABLISHMENT SMR LABORATORY FORT
HALSTEAD
EXAMINATION OF NITRATOR DILUTOR AND COOLER STIRRERS FOR RDX
PLANT AT ROF BRIDGWATER
1647 52
1952

00093
0012282 26
ARMAMENT RESEARCH ESTABLISHMENT SMR LABORATORY FORT
HALSTEAD
INVESTIGATIONS INTO RDX PLANT AT ROF BRIDGWATER
1624 51
1951

00094
0012283 27
ARMAMENT RESEARCH ESTABLISHMENT SMR LABORATORY FORT
HALSTEAD
METALLURGICAL EXAMINATION OF STAINLESS STEEL STIRRERS FOR RDX
MANUFACTURE
1686 52
1952

00095
0012284 28
ARMAMENT RESEARCH ESTABLISHMENT SMR LABORATORY FORT
HALSTEAD
RDX PLANT CONCENTRIC TUBE THERMOMETER
1759 52
1952

00096
0012285 29
ARMAMENT RESEARCH ESTABLISHMENT SMR LABORATORY FORT HALSTEAD
EXAMINATION OF TWELVE NEW DILUTOR AND COOLER STIRRERS FOR RDX MANUFACTURE ROF BRIDGWATER
1770 53
1953

00097
0012286 30
ARMAMENT RESEARCH ESTABLISHMENT
STAINLESS STEEL STIRRERS FOR RDX PLANT
AR 242 21
1953

00101
0012520 3427
ROWE J
MINISTRY OF SUPPLY
DEVELOPMENT AND TESTING OF PLASTIC EXPLOSIVE PART 1
MEMO 1 50
1950

00102
0012521 3426
SIMMONS W H
MINISTRY OF SUPPLY ROYAL ORDNANCE FACTORY BRIDGWATER
PREVENTION OF ICING IN RDX MANUFACTURE
ERDE XR 172 19
1955

00106
0012709 56
MACDOUGALL D P
ADVISORY COUNCIL ON SCIENTIFIC RESEARCH AND TECHNICAL DEVELOPMENT RDX RESEARCH PANEL
PHLEGMATIZATION OF RDX
AC 3569
1943

00113
0012716 63
ADVISORY COUNCIL ON SCIENTIFIC RESEARCH AND TECHNICAL DEVELOPMENT EXPLOSIVE
RESEARCH COMMITTEE
REVIEW OF THE RDX RESEARCH IN HAND AND PROPOSED WITH A VIEW TO INCREASE EFFICIENCY AND REDUCTION IN COST OF RDX MANUFACTURE
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SPRINGALL H D
ADVISORY COUNCIL ON SCIENTIFIC RESEARCH AND TECHNICAL DEVELOPMENT RDX RESEARCH PANEL
RDX RESEARCH PROGRAMME SUGGESTIONS FOR FURTHER INVESTIGATIONS
AC 4059 BRIST 81
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00119
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CRDE 3 R 48
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00120
0012723 70
CHARD S
EXPLOSIVES RESEARCH AND DEVELOPMENT ESTABLISHMENT
MANUFACTURE OF RDX TNT BY WET PELLETING METHOD
ERDE 10 R 50
1950

00122
0012726 73
HURN R C ROY A R
SOUTHWEST SCOTLAND BRANCH RESEARCH DEPARTMENT WOOLWICH ROYAL TECHNICAL COLLEGE GLASGOW
DIRECT RECOVERY OF NITRIC ACID FROM RDX NITRATION MIXTURE
AC 5189 GLAS 253
1943

00123
0012727 74
RUMFORD F EDWARDS G E
SOUTHWEST SCOTLAND BRANCH RESEARCH DEPARTMENT WOOLWICH
ROYAL TECHNICAL COLLEGE GLASGOW
POSSIBLE ECONOMIES IN RDX MANUFACTURE
AC 6487 GLAS 293
1944

00125
0012729 76
CHARD S
EXPLOSIVES RESEARCH AND DEVELOPMENT ESTABLISHMENT
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ERDE 19 R 49
1949

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0012732 79
WALLACE R A
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ERDE 2 M 51 XR 551 6
1951

00132
0012737 83
ADVISORY COUNCIL ON SCIENTIFIC RESEARCH AND TECHNICAL
DEVELOPMENT RDX RESEARCH PANEL
EXAMINATION OF RDX SAMPLES FROM ROF BRIDGWATER
ARD 503 44 AC 5604
1944

00146
0012752 98
ARMAMENT RESEARCH AND DEVELOPMENT ESTABLISHMENT FORT
HALSTEAD
FORMATION OF HMX IN WOOLWICH PROCESS FOR MANUFACTURE OF RDX
ARD 183 43
1943

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0012764 3488
FORSTER A
MINISTRY OF DEFENCE ROYAL ORDNANCE FACTORIES
VISITS TO ROF BRIDGWATER AND ROF PEMBREY FEBRUARY 1962
1962

00166
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ROYAL ORDNANCE FACTORY BRIDGWATER
NOTES FROM RDX LITERATURE AT BRIDGWATER

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MINISTRY OF DEFENCE WAR OFFICE
RDX PROJECT SOUTH AFRICA OPERATING MANUAL

00168
0013366 3315
SIMMONS H H FORSTER A BOWDEN R C
MANUFACTURE OF RDX IN GREAT BRITAIN
1948

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0013372 3309
RICHARDS R
ROYAL ORDNANCE BRIDGWATER
CONVERSION OF RDX HMX MIXTURES TO USABLE FORMS
BGW TN 235
1987

00173
0013397 3284
BELL J A SALTER D A
PROPELLANTS EXPLOSIVES AND ROCKET MOTOR ESTABLISHMENT
WALTHAM ABBEY
PREPARATION OF HMX
TR 68
1978

00190
0013482 3206
RICKARD M C RUDRAM T A
MATERIALS QUALITY ASSURANCE DIRECTORATE
STUDY OF DEVELOPMENT OF COLOUR DURING PROCESSING IF RDX TNT
MQAD 235
1975

TYPE 4/A/1

Quest Accession Number : 95050491

DE95009487/XAD NTIS Issue: 9518 CONFERENCE PROCEEDING

Technology assessment of RDX production.

Notes: Life cycles of energetic materials, Del Mar, CA (United States), 11-16 Dec 1994. Sponsored by Department of Energy, Washington, DC.

Author(s): Coburn, M. D.

Corp. Source: (072735000 9512470) Los Alamos National Lab., NM.

Sponsor: Department of Energy, Washington, DC.

NTIS Prices: PC A02/MF A01. Journal Announcement: GRAI9518; n9538

Number of Report: LA-UR-95-1107; CONF-941255-2. Number of Contract: W-7405-ENG-36

Publication Year: 1995. Pagination: 6p

Language: English. Country of Publication: United States

The known processes for producing RDX were assessed with the goal of identifying the process that would generate the least waste and pollution. It was concluded that the Bachman process employed at Holston AAP is the most economical process for producing RDX and that it probably produces less waste than any other process. It was generally agreed that the entire Holston operation is a very clean one that complies with all federal and state emission standards. In addition, a number of opportunities in which Holston could reduce their wastes were identified. Preliminary assessments of waste and pollution profiles for alternate materials, with emphasis on dual-use materials, were performed.

Classification: 79A Ordnance-Ammunition, explosives & pyrotechnics

Controlled Terms: *Chemical Explosives / *Chemical Plants / Amines / Material Substitution / Nitro Compounds / Pollution Abatement / Production / Pyrotechnic Devices / Technology Assessment / Waste Management / Meetings

EDB/450100 / EDB/320305

Uncontrolled Terms: NTISDE

TYPE 4/A/3

Quest Accession Number : 81011417

PB80-979770 NTIS Issue: 8100

Comparison of Batch and Continuous Comp B Production: Composition B explosive made by the continuous process has large RDX crystals, but is satisfactory. (NTIS Tech Note.)

Notes: Support package of reports of this Tech Note is available as PB80-979771 for 10.00.

This Tech Note is not available separately. Must be ordered as PB80-925710 (Manufacturing), PB80-925910 (Ordnance). PC E02.

NTIS Prices: For order number and price see below. Journal Announcement: d8105

Pagination: 1p

Language: English. Country of Publication: United States
No abstract available.
Classification:
19A Ordnance-Ammunition, explosives & pyrotechnics
13H Engineering-Industrial processes
97A Energy-Reserves
94A Industrial & Mechanical Engineering-Production planning & process controls
Controlled Terms: *Explosives / * Batching / * Process control
*Batching process / * Continuous process / NTN/G / NTN/T

TYPE 7/A/1
Quest Accession Number : 07095954
107(11)095954 CHEMABS journal
Wartime research on RDX. "A false hypothesis is better than no hypothesis"
Edward, John T.
McGill Univ. Montreal Can. CA PQ H3A 2K6
J. Chem. Educ.; (87) P 599-603; Vol 64; No 7; In Eng; Coden: JCEDA; ISSN: 0021958;
Sections: 120002 / 150
Registry No.: 121-82-4 <history of wartime research in>
Mol. Formula: C3H6N6O6
Terms: RDX wartime research history
CT: HISTORY,<of RDX wartime research>