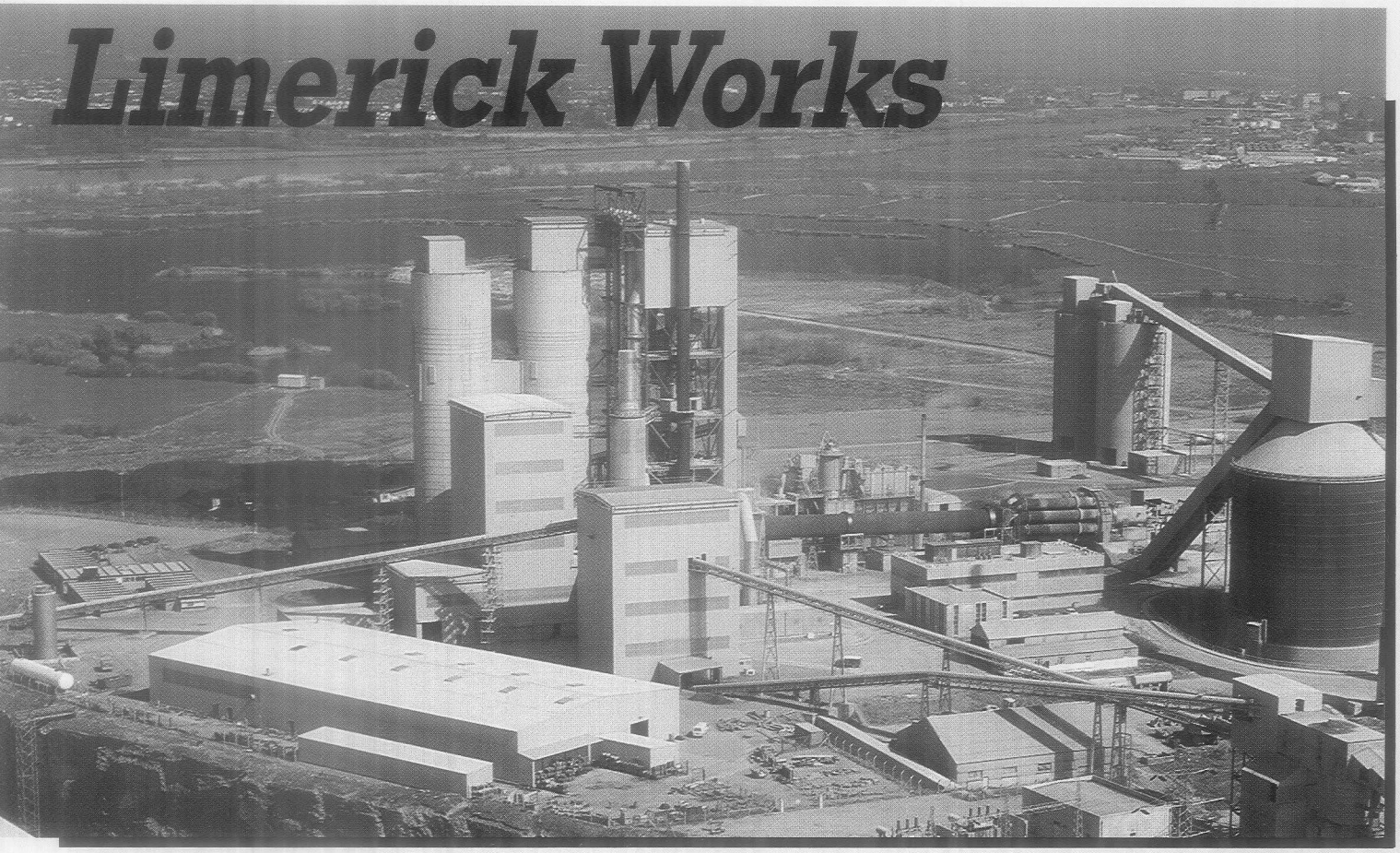
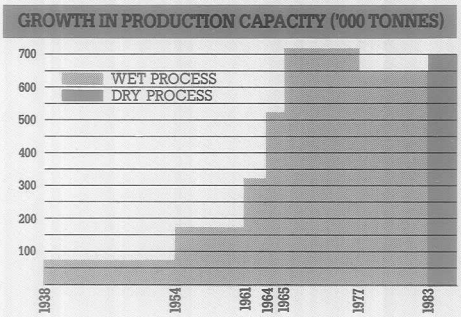
Limerick Works



Limerick Cement Works dates back to the late thirties and the first deliveries of cement from the original small single wet process kiln took place in 1938. Predictably the war years 1939-45 caused a dramatic drop in building activity in Ireland and the initial capacity was sufficient to meet market needs for almost 15 years. By 1954 however the rising demand for cement called for expansion and the years that followed saw an almost continuous series of projects which by 1965 had increased annual capacity to 725,000 tonnes from 5 wet process kilns.



Subsequent growth in demand was met by the development of Platin Works in Co. Meath. When this was completed in 1977 the original 39 year old small kiln at Limerick was shut down. It was not until 1980 that forecasts of further growth in construction activity indicated the need for additional development at Limerick. A dry process kiln was completed early in 1983 bringing the works annual production capacity to 1,350,000 tonnes. But anticipated growth in demand into the 80's did not materialise and so the remaining 4 older wet process kilns were taken out of service on completion of the new unit.

Easy access to limestone, clay and shale made Limerick a logical area for cement manufacture. As far back as 1904 Limerick Harbour Authority prepared a detailed report indicating the potential of local materials for cement production at Castlemungret.

Limestone quarrying

Furthermore, the developments which had evolved internationally over preceding decades in automation and process control mean that Limerick Works now reaches the highest standards for product consistency and environmental protection. The introduction of the newer dry process at Limerick also provides benefits in terms of fuel efficiency.

Today Irish Cement Limited's modern dry process kiln supplies the market in southern and western parts of the country and also serves export markets when required.

Normal Portland Cement

I.S. 1: 1991

General

Normal Portland Cement (NPC) is by far the most widely used cement type in Ireland. Its chemical and physical properties make it suitable for the majority of jobs, large or small, where no special or unusual considerations arise. It is available either in bag or in bulk, and is guaranteed to comply fully with the physical and chemical requirements of Irish Standard No. 1 : 1991 (I.S.1). Normal Portland Cement is manufactured at modern dry process works at Castlemungret, Co. Limerick, and Platin, Co. Meath, where advanced quality control systems ensure a high level of product consistency and performance.

Product Data

Information is given on the performance aspects of the cement which are of direct interest to specifiers and users, and all data is related to the requirements of I.S.1: 1991. Details are based on testing of recent bulk dispatches of Normal Portland Cement.

Setting Time

The requirements of I.S.1 include a minimum initial setting time of 60 minutes. Initial set for Normal Portland Cement typically exceeds 90 minutes, and final set normally takes place in less than 4 hours.

Strength

Minimum compressive strengths of 10 MPa at 2 days and 42.5 MPa at 28 days are stipulated in I.S.1 (Class 42.5). These are based on tests on standard mortar prisms. Strengths are typically 50 MPa at 28 days for Normal Portland Cement produced at Platin and Limerick Works.

Of particular interest to users is the anticipated rate of strength development of concrete, particularly the 7/28 day relationship. Currently Normal Portland Cement produced at Platin reaches approximately 70% of the 28 day strength at 7 days. The product from Limerick Works gains approximately 80% of the 28 day strength at 7 days. It is emphasised however that strength development is significantly affected by mix proportions, ambient temperature and the efficiency of site curing. For this reason this data should be applied with discretion when evaluating early age cube results.

Chemical Composition

Normal Portland Cement complies fully with all requirements of I.S.1. Sophisticated quality control procedures maintain a high level of consistency in both Works. Detailed information on chemical and compound composition is available on request.

Test Certificates

Comprehensive test certificates indicating current levels of performance on key physical and chemical parameters are available on request.

Guarantee of Overall Quality and Performance

In addition to the company's own guarantee, Normal Portland Cement is subject to regular independent quality verification by the National Standards Authority of Ireland and is Certified to I.S.1. in accordance with the particular regulations applicable to Portland Cement.

Platin and Limerick Works hold IS/ISO 9002/ EN 29002 Quality Systems Certification from the National Standards Authority of Ireland.

Storage and Handling

The performance of cement will be adversely affected by unsuitable storage conditions. The material should be stored dry and protected from wind and rain.

Health and Safety

Prolonged contact with freshly mixed mortar or concrete may cause skin irritation and should be avoided. A detailed Health & Safety Product Data Sheet is available on request.

Advice and Information

As part of its ongoing commitment to the quality of design and construction in concrete, Irish Cement Limited provides a specialised information service on the performance and application of its products. Engineers with wide experience of the use of cement and concrete are available to answer queries and give advice. They may be contacted at the Technical Marketing Department, Stillorgan Road, Stillorgan, Co. Dublin. Tel: (01) 288 3888, Fax (01) 288 7333.

Other Cements

Irish Cement Limited also manufactures Rapid Hardening Portland Cement (RHPC), Sulphate Resisting Portland Cement (SRPC) and Oilwell Cement. Similar data sheets on each of these products are available on request.

I.S.1.: 1991

REGISTERED FIRM

I.S./ISO 9000/EN 29000
QUALITY SYSTEM

Irish Cement

Sulphate Resisting Portland Cement

B.S. 4027 : 1991

General

Sulphate Resisting Portland Cement (SRPC) is a specialised product used where sulphates are present in concentrations that would damage Normal or Rapid Hardening Portland Cement Concrete.

Recommendations outlining the level of sulphates above which the use of this cement is necessary are contained in the current code for the structural use of concrete. Sulphate resistance is achieved by adjustments to chemical composition and this slightly darkens it's colour. As there is no Irish Standard for Sulphate Resisting Cement, the product is guaranteed to comply with the requirements of British Standard No. 4027. It is manufactured at Castlemungret, Co. Limerick, where advanced quality control systems ensure a high level of product consistency and performance. It is available in bag or in bulk.

Product Data

Information is given on the performance aspects of the cement which are of direct interest to specifiers and users, and all data is related to the requirements of B.S. 4027 : 1991. Details are based on testing of recent bulk dispatches of Sulphate Resisting Portland Cement.

Setting Time

The requirements of B.S. 4027 include a minimum initial setting time of 60 minutes. Initial set for Sulphate Resisting Portland Cement typically exceeds 90 minutes, and final set normally takes place in less than 4 hours.

Strength

Minimum compressive strengths of 10 MPa at 2 days and 42.5 MPa at 28 days are stipulated in B.S. 4027 (Class 42.5N). These are based on tests on standard mortar prisms. Strengths are typically 53 MPa at 28 days for Sulphate Resisting Portland Cement.

Of particular interest to users is the anticipated rate of strength development of concrete, particularly the 7/28 day relationship. Currently Sulphate Resisting Portland Cement produced at Limerick reaches approximately 75% of the 28 day strength at 7 days. It is emphasised however that strength development is significantly affected by mix proportions, ambient temperature and the efficiency of site curing. For this reason this data should be applied with discretion when evaluating early age cube results.

Chemical Composition

Sulphate Resisting Portland Cement complies fully with all requirements of B.S. 4027. Sophisticated quality control procedures maintain a high level of consistency in the Works. Detailed information on chemical and compound composition is available on request.

Test Certificates

Comprehensive test certificates indicating current levels of performance on key physical and chemical parameters are available on request.

Guarantee of Overall Quality and Performance

In addition to the company's own guarantee, Sulphate Resisting Portland Cement is subject to regular independent quality verification by the British Standards Institution and Limerick Works has received a Kitemark Licence from BSI for the manufacture of Sulphate Resisting Portland Cement.

Limerick Works holds IS/ISO 9002/ EN 29002 Quality Systems Certification from the National Standards Authority of Ireland.

Storage and Handling

The performance of cement will be adversely affected by unsuitable storage conditions. The material should be stored dry and protected from wind and rain.

Health and Safety

Prolonged contact with freshly mixed mortar or concrete may cause skin irritation and should be avoided. A detailed Health & Safety Product Data Sheet is available on request.

Advice and Information

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Other Cements

Irish Cement Limited also manufactures Normal Portland Cement (NPC), Rapid Hardening Portland Cement (RHPC) and Oilwell Cement. Similar data sheets on each of these products are available on request.

B.S. 4027: 1991

REGISTERED FIRM

I.S./ISO 9000/EN 29000
QUALITY SYSTEM

Irish Cement

Cement Production

Introduction

Cement production involves the fusing together at high temperature of a precisely controlled blend of very finely ground limestone and shale. The resultant clinker is then finely ground with the addition of about 5% of gypsum. Both Limerick and Platin Works use the modern dry production process.

The consequent elimination of large quantities of mixing and blending water which characterised the older wet process enables savings to be made in fuel traditionally used to drive off moisture. Both factories can operate using either pulverised coal or oil and the choice of fuel is dictated largely by cost considerations and availability.

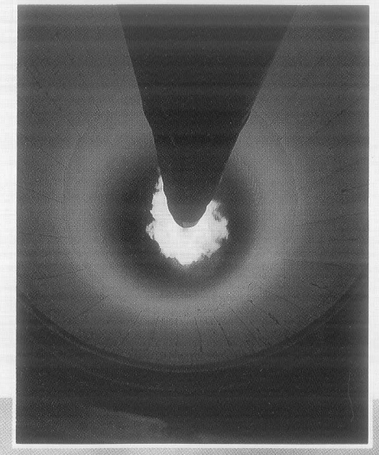
Preliminary Processing

Limestone consisting almost entirely of calcium carbonate ($CaCO_3$) and shale containing a high proportion of silica(SiO_2) with lesser amounts of alumina(Al_2O_3) and ferrous oxide (Fe_2O_3) provide the essential constituents for the manufacture of cement. Separately crushed and stored, the materials are then blended in proportions of about 4:1 limestone:shale and ground to very fine powder. The care and attention given to eliminating natural variation at this stage has a critical influence on the consistency and performance of the finished product. During this operation sophisticated blending techniques and hourly checking of chemical composition play a very important role.

The burning process

Burning takes place in the rotary kiln. This is a large, long, welded steel tube lined with fire resistant bricks and concrete and inclined slightly towards one end. It rotates slowly and continuously about it's longitudinal axis and is fired by either oil or pulverised coal at it's lower end. Raw meal is preheated by kiln exhaust gases before entering the upper end of the kiln. The rotation of the unit gradually conveys the powder towards the firing zone. Initially carbon dioxide is driven off. As the temperature continues to rise the original raw meal undergoes further changes until at temperatures approaching 1500°C a white hot mass with a complex chemical composition is produced.

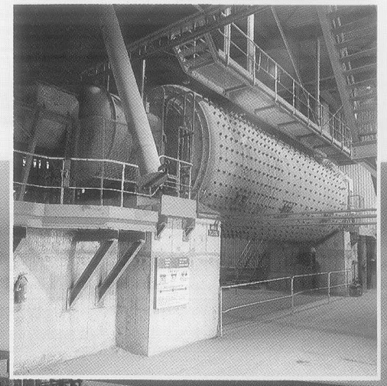
On cooling this has the appearance of dark grey irregular gravel and is called cement clinker



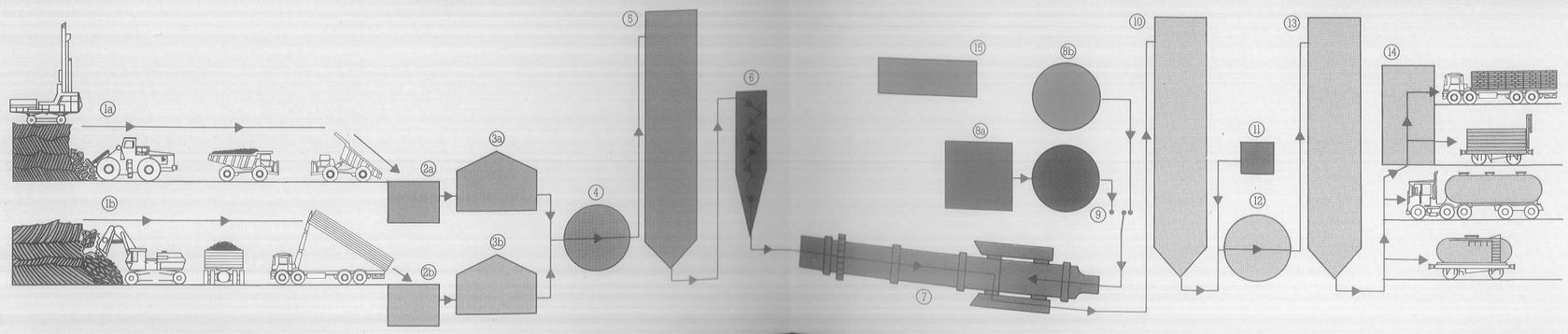
Burning zone.

From clinker to cement

All that is now required is to grind the clinker to a very fine powder in a ball mill. During this operation – achieved by the tumbling action of many tons of steel balls and cylindrical bodies within a rapidly rotating steel cylinder – about 5% of gypsum is interground. This controls the setting time of the cement to a level appropriate for practical site use. The finished product is then stored in large silos to await despatch either in bulk or packed in paper sacks.



Cement mill.



1a Limestone quarrying 1b Shale quarrying 2a Limestone crushing 2b Shale crushing 3a Limestone storage 3b Shale storage 4 Milling of limestone/shale mixture 5 Storage of milled material – raw meal 6 Preheating of raw meal 7 Burning of raw meal to clinker

8a Coal storage 8b Oil storage 9 Coal milling 10 Clinker storage 11 Gypsum storage 12 Clinker milling with gypsum addition 13 Cement storage 14 Cement dispatch – bulk and packed; road and rail 15 Central control

Limerick Works
Castlemungret

Irish Cement

Products

A range of cements to Irish and International Standard Specifications is produced at Limerick Works.

Product Quality

Limerick Works operates quality control procedures to the highest standards to ensure that raw material variations are smoothed and products of appropriate quality are consistently produced. Targets for all the main physical and chemical parameters are established, and feed-back control systems coupled with the automated production process ensure consistency is maintained at all stages of product manufacture.

Quality Assurance

In addition to Irish Cement Limited's own product quality guarantees, Limerick Works and its products are subject to regular independent quality verification by the National Standards Authority of Ireland. Normal and Rapid Hardening Portland Cements produced at Limerick are Certified to I.S.1:1991 by N.S.A.I. and Limerick Works has also obtained IS/ISO 9002/EN 29002 Quality Systems Certification from N.S.A.I. Similar Product and Systems Certifications have been obtained from the British Standards Institution.

Information

As part of its ongoing commitment to the quality of design and construction in concrete, Irish Cement Limited provides a specialised information service on the performance and application of its products. Engineers with wide experience of the use of cement and concrete are at all times available to answer queries and give advice.

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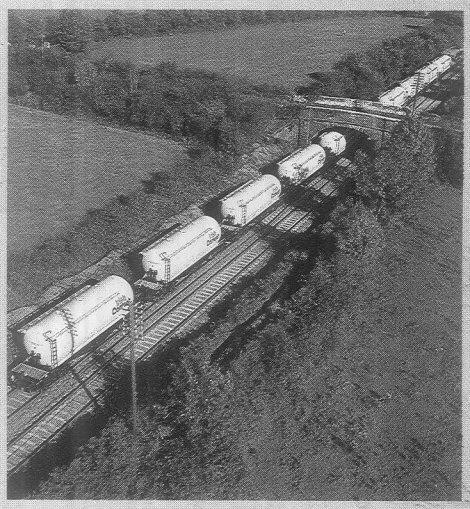

Bulk cement liner train.

I.S.1.: 1991
LICENCE No. 174

REGISTERED FIRM
I.S./ISO 9000/EN 29000
QUALITY SYSTEM
CERTIFICATE No. M294