

**Hanson Cement, Ribblesdale Works**

**Application for variation to EPR permit EPR/BL7272IB**

**Burning of solid recovered fuel (SRF), recovered fuel oil (RFO), and  
meat and bone meal on kiln 7**

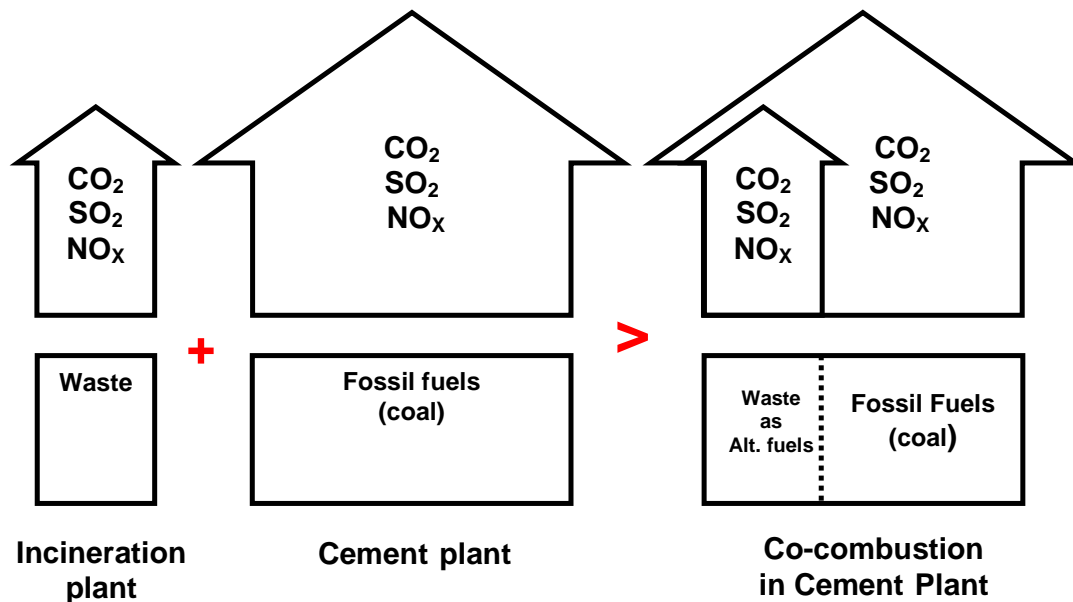
**April 2011**

## **1 Non Technical Summary**

### **C1.1 Background**

- 1.1.1. Cement is an internationally traded commodity product. Overseas manufacturers are able to transport cement by sea in bulk at very low costs and land imported cement at import terminals that are not subject to the same environmental regulations and carbon constraints as UK manufacturers. To remain competitive the UK cement industry needs to reduce its operating costs.
- 1.1.2. In 2006 Hanson Cement completed a major investment programme to produce all cement clinker using the most energy efficient dry process kilns. Even operating the most energy efficient kilns is not sufficient to remain competitive with overseas manufacturers who can sell cement on a marginal cost basis. (i.e. at the cost price plus a small margin).
- 1.1.3. The environmental impacts of shipping are substantial; transporting cement from the Eastern Mediterranean and beyond to the UK can increase carbon dioxide emissions by over 10% compared to domestic production.
- 1.1.4. The electrical power consumption of dry process kilns is higher than wet process kilns. At Ribblesdale, kiln 7 operates with a wet gas scrubber, which increases the process power consumption still further.
- 1.1.5. Hanson Cement has limited control over the price of electricity supplied to its works, therefore the best opportunity to control costs is kiln fuel. Typically, the cost of kiln fuel represents up to 40% of the variable cost of the manufacture of cement.
- 1.1.6. Hanson Cement, along with the other UK cement producers, has signed a climate change levy agreement with the UK Government. The agreement sets a target for energy consumption (for both kiln fuel and electricity), which translates into a substantial reduction in carbon dioxide emissions, the main greenhouse gas. If these targets are met, then the cement companies qualify for a reduction in their levy payments. The agreement with the Government is based upon process improvements and the increased use of alternative fuels, which are treated as having zero carbon dioxide emissions. When waste is used as fuel in a cement kiln it replaces fossil fuels such as coal. If the waste were incinerated the energy content of the waste would not be recovered, resulting in higher global emissions as shown in the illustration below.
- 1.1.7. The European Union Emission Trading Scheme (EUETS) has placed an additional constraint on energy intensive industries such as cement. The EUETS has resulted in increased electricity prices which has further eroded the competitiveness of the UK cement industry in relation to non EU imports. Phase 3 of EUETS (starting in 2013) will require electricity producers to purchase all their allowances; this will result in a further rise in operating costs.

The EUETS treats all biomass as carbon neutral; therefore the use of these fuels allows Hanson Cement to both control costs and reduces greenhouse gas emissions.



- 1.1.8. Hanson Cement has been using alternative fuels since 1992 when Cemfuel, a liquid fuel manufactured from industrial wastes such as paints and printing inks, was introduced at Ribblesdale. Since then the company has steadily increased the use of alternative fuels at its sites and now additionally use whole and chipped tyres, meat and bone meal (MBM), and SRF, a fuel made from solid wastes such as paper and plastics.
- 1.1.9. The use of solid recovered fuel (called SRF in this application) will give Hanson Cement another source of partial biomass fuel along side tyre chips, this will allow the company to increase the use of biomass and provide greater security of supply of biomass for the future.
- 1.1.10. All the SRF used as fuel at Ribblesdale will be from non hazardous sources.
- 1.1.11. The use of Recovered Fuel Oil (RFO) will give Hanson Cement a second source of liquid fuel and provide greater security of supply for the future. The use of RFO will replace mainly coal and Cemfuel used on the kiln main burner.
- 1.1.12. The use of MBM on the kiln main burner will allow an increase in the overall use of biomass on the kiln.
- 1.1.13. There is unlikely to be a significant change in deliveries to the site when these fuels are used as the energy content of SRF is similar to MBM. However, there may be a slight reduction with the introduction of RFO as the energy content of this fuel is greater than Cemfuel but it is considered that this reduction may not necessarily be noticed. It should be noted that the closure of kilns 5 and 6 in 2005 reduced the traffic flow into and out of the works by approximately 40%.

**C1.2 Description of the Proposal**

- 1.2.1 The SRF will be delivered to Ribblesdale by road and discharged into the SRF handling system by walking floor vehicles.
- 1.2.2 The SRF will be transported to the calciner using the SRF conveyor system, where it will be used as fuel to replace the current fossil fuel.
- 1.2.3 The SRF will be conveyed pneumatically to the kiln main burner where it will be used as a fuel to replace the current fossil fuel.
- 1.2.4 A process flow diagram of the proposed SRF installation is shown in appendix 1.
- 1.2.5 The RFO will be delivered to Ribblesdale in tankers and discharged into the RFO storage tank(s).
- 1.2.6 The RFO will be transported to the kiln main burner by use of a dedicated pump system where it will be used as fuel to replace the current fossil fuel.
- 1.2.7 The use of SRF, in addition to the other alternative fuels already in use at Ribblesdale, will also give the company greater flexibility to secure and manage the supply of fuels.
- 1.2.8 The use of alternative fuels is considered to represent the Best Available Techniques (BAT) for the manufacture of cement. The SRF and MBM would otherwise be disposed of in landfill and its use in a cement kiln reduces fossil fuel consumption. In terms of the environmental impacts of transport, SRF will travel shorter distances than some sources of coal which can come from as far away as South America, thus transport impacts can also be reduced.
- 1.2.9 Emissions of carbon dioxide are expected to be reduced, and all other emissions to air from kiln 7 will be largely unaffected by the use of SRF as a replacement for fossil fuel. Carbon dioxide emissions will be reduced, as the SRF is around 60% biomass. Biomass fuels are carbon neutral in accordance with the EU emissions trading directive.
- 1.2.10 There will be no change in emissions to water or land resulting from the use of SRF and RFO.
- 1.2.11 On completion of the emissions monitoring programme a technical evaluation report will be submitted to the Environment Agency assessing the environmental impacts arising from the use of SRF at Ribblesdale.
- 1.2.12 Processed fuel oil (PFO) a product conforming to the Environment Agency/WRAP quality protocol will be used instead of gas oil for kiln light ups. The PFO will be stored in the existing kiln 7 gas oil tank. There will be no change in emissions to land or water as a result of using PFO. PFO is produced from waste oils so each litre used is conserving virgin fossil fuels. There will be a negligible increase in SO<sub>2</sub> emissions as a result of the higher sulphur content of PFO when compared with gas oil.

### **C1.3 The Proposed Variation**

- 1.3.1 Hanson Cement is seeking a variation to EPR permit EPR/BL7272IB/V006 to allow the use of SRF as a partial replacement of coal on kiln 7 at Ribblesdale at up to 60% of the kiln's fuel requirements (split between the main burner and the calciner).
- 1.3.2 In addition Hanson Cement is seeking a variation to EPR permit EPR/BL7272IB/V006 to allow the use of recovered fuel oil as a partial replacement of coal on kiln 7 at Ribblesdale at up to 40% of the kiln's fuel requirements.
- 1.3.3 Hanson Cement is also seeking a variation to EPR permit EPR/BL7272IB/V006 to allow the use of MBM on the kiln main burner as a partial replacement of coal on kiln 7. The total MBM replacement rate will remain unchanged at up to 60% of the kiln's fuel requirements (split between the main burner and the calciner).
- 1.3.4 The use of SRF and RFO will enable further flexibility in the range of fuels that can be used at Ribblesdale.
- 1.3.5 Hanson Cement is also seeking permission to use processed fuel oil (PFO), a product produced in accordance with the Environment Agency/WRAP Processed Fuel Oil Quality Protocol for kiln light ups as a substitute for gas oil or kerosene.
- 1.3.6 Hanson Cement will comply with the conditions laid out in the permit, however, the variation will require the following changes to the permit.

Amend Table S2.1 as below to include SRF, RFO, and PFO:-

Table S2.1 Raw materials and fuels			
Raw materials and fuel description	Specification		
SRF	EWC Number	19 02 10 and 19 12 10	
	Gross CV	10 -40 MJ/kg	
	Sulphur	≤ 2.0%	
	Chlorine	≤ 2.0%	
	Total Fluorine, Bromine & Iodine	≤ 1.5%	
	Mercury	≤ 10 mg/kg	
	Group II Metals :- (Total Cadmium & Thallium)	≤ 30 mg/kg	
	Specific Group III Metals :-		
	Copper	≤ 500 mg/kg	
	Lead	≤ 300 mg/kg	
	Total Group III Metals	≤ 800 mg/kg	
	Processed Fuel oil (PFO)		Compliant with Environment Agency/WRAP Processed Fuel Oil Quality Protocol
	Recovered fuel oil (RFO)	EWC Number	<i>To be agreed with EA</i>
Gross CV		30 – 48 MJ/kg	
Sulphur		≤ 2.0%	
Chlorine		≤ 2.0%	
Total Fluorine, Bromine & Iodine		≤ 1.5%	
Mercury		≤ 20 mg/kg	
Group II Metals :- (Total Cadmium & Thallium)		≤ 40 mg/kg	
Specific Group III Metals :-			
Copper		≤ 1000 mg/kg	
Lead		≤ 800 mg/kg	
Total Group III Metals		≤ 1800 mg/kg	

Amend Table S2.2 to include SRF and RFO and amend the MBM thermal input location:-

Table S2.2 Permitted waste fuel types and quantities		
Waste Fuel Type	Where used and maximum % of Total Thermal Input	Total Usage Rates
SRF	Main burner and calciner 60%	0 - 60% thermal input 0 – 19.18 tonnes/hour 0 – 152,214 tonnes/ year
Recovered fuel oil	Main burner only 40%	0 - 40% thermal input 0 – 2.77 tonnes/hour 0 – 22,000 tonnes/ year
MBM	Main burner and calciner 60%	0 - 60% thermal input 0 – 19.18 tonnes/hour 0 - 152,214 tonnes/ year

#### C1.4 Site report

- 1.4.1 The SRF unloading and handling equipment will be constructed on an area that already has a concrete surface. As the material is solid and insoluble there will be no impact on ground conditions.
- 1.4.2 The RFO will be stored in a tank within a bunded area constructed as required by the Oil Storage Regulations (England) 2001 and Environment Agency pollution prevention guidelines PPG02 above ground oil storage.
- 1.4.3 The PFO will be stored in the current kiln 7 25,000 litre capacity gas oil tank, this tank and bund is already compliant with the above regulations and guidance.
- 1.4.4 These areas of the works were covered in the existing site report submitted with the original PPC application of August 2001 and subsequent associated reports. Since these locations are already covered with a concrete apron no additional ground investigation work is planned as part of this variation application.

#### C1.5 Substantial change

- 1.5.1 The Environmental Permitting Regulations define substantial change, as “may have significant negative effects on human beings or the environment”. The introduction of SRF and RFO will result in no change or a reduction in emission from the installation; therefore the change is not substantial.
- 1.5.2 Solid Recovered Fuel (SRF) is already in use as a fuel at Hanson Cement’s Ketton and Padeswood works, and at plants operated by Cemex UK and Lafarge Cement UK. The specification of the SRF will be the same as the Environment Agency standard specification which is already permitted at these other cement plants. The use of this material as partial replacement of coal at Ketton in combination with Cemfuel, tyres, and meat and bone meal has resulted in no

significant change in emissions (except a reduction in carbon dioxide emissions due to the increased biomass content of the fuels). The effect of introducing alternative fuels has consistently had a positive environmental impact. Emissions data from Ketton when using SRF produced to the same specification as proposed for Ribblesdale has resulted in no change in emissions, and there are no reasons to expect any difference at Ribblesdale works.

- 1.5.3 MBM is already permitted for use at Ribblesdale works in the calciner. The use of this material on the main kiln burner is already permitted at Hanson Cement's Ketton works. The use of this material as a partial replacement for coal has resulted in no significant change in emissions (except a reduction in carbon dioxide emission due to the increased biomass content of the fuels). As the combustion conditions in the kiln are significantly hotter in the kiln than the calciner it is extremely unlikely that there will be any change in emissions as a result of using MBM in the kiln.
- 1.5.4 The impact of the site was assessed in the PPC application. Since a reduction or no change in emissions is expected, the impacts on human health calculated as a lifetime cancer risk of 1 in 67,000,000 compared with the assessment criteria of 1 in 14,300 will be unchanged. For further details see annex E, Expanded air quality assessment: Ribblesdale Works 1 May 2002. Given this extremely low level of risk we consider the health impacts are currently insignificant and will remain insignificant when SRF and RFO are used as a fuel.
- 1.5.5 The extent of the potential impact (including geographical area and size of population affected) is considered insignificant. The results from the 2005 MBM trial and subsequent monitoring data demonstrate a reduction in emissions from the kiln and no impact from the storage and handling of MBM on site.
- 1.5.6 The effects on specifically protected areas, species, etc. identified in the PPC permit application demonstrated an insignificant impact on these sites. Since there is likely to be no change in kiln emissions, there will be a negligible impact on these sites.
- 1.5.7 The transboundary nature of the impact of the site will be reduced as a result of the reduction in global greenhouse gas emissions.
- 1.5.8 There will be no change in the magnitude and complexity of the already low impact of emissions from kiln 7. The impact of the site as a whole will remain unchanged in terms of releases to water and land. There will be a reduction in carbon dioxide emissions from the kiln and other kiln emissions will be unchanged, thus there will be no change in complexity.
- 1.5.9 The probability of the impact remains unchanged.
- 1.5.10 The duration and frequency of coal milling will be unchanged or decrease, thus there is no significant change in impact. As emissions are unchanged, the reversibility of the impact is unchanged with the exception of the reduction in carbon dioxide emissions which will contribute to reducing or reversing global climate change.
- 1.5.11 Hanson Cement believes that for the reasons presented above the use of SRF and RFO should not be treated as a substantial change.

## C1.6 Consultation

- 1.6.1 Hanson Cement has undertaken a consultation process with the local community in line with requirements of the BCA code of practice for the use of waste derived fuels.
- 1.6.2 The use of SRF, RFO, and PFO as fuels on site has been discussed with representatives of the local community at the Hanson Cement Liaison Committee.
- 1.6.3 A letter outlining the company's proposals for the use of SRF, RFO, MBM and PFO at the Ribblesdale works has been sent to stakeholders.
- 1.6.4 As part of the consultation copies of the application have been sent to the following bodies for comment:
- Health and Safety Executive
  - Health Protection Agency
  - Food Standards Agency
  - Natural England
  - Ribble Valley Borough Council
  - Lancashire County Council
  - United Utilities
- At the time of making the application two of the consultees had commented upon the proposals. Copies of their response are available if required.
- 1.6.5 In line with the company's open door policy if any members of the public wish to visit the site to discuss this variation application or any other matter, this can be arranged by telephoning the works on 01200 422401.
- 1.6.6 A copy of this application will also be published on the company's website, [www.hanson.com/uk/cement](http://www.hanson.com/uk/cement). Any questions arising from members of the public can also be sent by e mail to [enquiries@hanson.com](mailto:enquiries@hanson.com)

## C2.1 Activities and process techniques

- 2.1.1 A full process description of kiln 7 is given in the IPPC application section CCL/Ribblesdale/2.3/BAT/0801.
- 2.1.2 This application is to replace up to 60% of the kiln fuel requirement with SRF in the main burner and the calciner, up to 60% of the kiln fuel requirement with MBM in the main kiln burner and the calciner, and up to 40% of the kiln fuel requirement with RFO in the main kiln burner.
- 2.1.3 SRF.**
- 2.1.4 The SRF will be delivered to site in walking floor road vehicles. The SRF will be discharged directly into a conveying system. From here SRF will be metered via

the SRF weighing system and conveyed to the calciner and/or the main burner using a dedicated conveying system.

2.1.5 Maximum thermal substitution will be controlled in a similar manner to the Cemfuel, MBM and chipped tyres. The calorific value of the SRF, the kiln feed tonnage, and the maximum authorised thermal replacement will be used as set points in a calculation to arrive at a figure for the maximum allowed tonnage. An example calculation is shown below.

$\text{Max SRF} = \frac{\text{Kiln Feed}^{(1)} \times \text{LOI}^{(2)} \times \text{Kiln Efficiency}^{(3)} \times 60\%^{(4)}}{\text{Profuel c.v.}^{(5)}}$	
(1)	Total kiln feed in tonnes per hour
(2)	% Loss on ignition – nominally 63%
(3)	Average kiln efficiency in GJ/kg
(4)	60% maximum daily average thermal replacement rate
(5)	Average SRF c.v, in MJ/kg

2.1.6 Interlocks are in place to prevent or stop the burning of SRF on kiln 7, as soon as practicable, during periods of unstable plant operation, plant malfunction or

- when the clinker production < 80te/hr or,
- the combustion chamber temperature is below, or falls below, 850°C when using non hazardous waste or hazardous waste where the content of halogenated organic substances (as chlorine) does not exceed 1%; or
- any continuous emission limit value in schedule 3 table S3.1 is exceeded due to disturbances or failures of the abatement systems, other than under 'WID abnormal operating conditions'.

**2.1.7 MBM**

2.1.8 MBM will be delivered to site in dedicated road tanker vehicles and discharged into the existing MBM storage silo. From here the MBM will be extracted by an additional screw feeder installed under the silo and pneumatically conveyed to the kiln main burner.

2.1.9 Maximum thermal substitution will be controlled in a similar manner to the Cemfuel, MBM and chipped tyres. The calorific value of the MBM, the kiln feed tonnage, and the maximum authorised thermal replacement will be used as set points in a calculation to arrive at a figure for the maximum allowed tonnage. An example calculation is shown below.

$\text{Max MBM} = \frac{\text{Kiln Feed}^{(1)} \times \text{LOI}^{(2)} \times \text{Kiln Efficiency}^{(3)} \times 60\%^{(4)}}{\text{MBM c.v.}^{(5)}}$	
(1)	Total kiln feed in tonnes per hour
(2)	% Loss on ignition – nominally 63%
(3)	Average kiln efficiency in GJ/kg
(4)	60% maximum daily average thermal replacement rate (main burner + calciner)
(5)	Average MBM c.v, in MJ/kg

2.1.10 Interlocks are in place to prevent or stop the burning of MBM on kiln 7, as soon as practicable, during periods of unstable plant operation, plant malfunction or

- when the clinker production < 80te/hr or,
- the combustion chamber temperature is below, or falls below, 850°C when using non hazardous waste or hazardous waste where the content of halogenated organic substances (as chlorine) does not exceed 1%; or
- any continuous emission limit value in schedule 3 table S3.1 is exceeded due to disturbances or failures of the abatement systems, other than under 'WID abnormal operating conditions'.

### 2.1.11 RFO

2.1.12 RFO will be delivered to site in dedicated road tanker vehicles and discharged into the RFO storage tank.

2.1.13 Maximum thermal substitution will be controlled in a similar manner to the Cemfuel, MBM and chipped tyres. The calorific value of the RFO, the kiln feed tonnage, and the maximum authorised thermal replacement will be used as set points in a calculation to arrive at a figure for the maximum allowed tonnage. An example calculation is shown below.

$\text{Max RFO} = \frac{\text{Kiln Feed}^{(1)} \times \text{LOI}^{(2)} \times \text{Kiln Efficiency}^{(3)} \times 40\%^{(4)}}{\text{Fuel c.v.}^{(5)}}$	
(1)	Total kiln feed in tonnes per hour
(2)	% Loss on ignition – nominally 63%
(3)	Average kiln efficiency in GJ/kg
(4)	40% maximum daily average thermal replacement rate
(5)	Average fuel c.v. in MJ/kg

2.1.14 Interlocks are in place to prevent or stop the burning of RFO on kiln 7, as soon as practicable, during periods of unstable plant operation, plant malfunction or

- when the clinker production < 80te/hr or,
- the combustion chamber temperature is below, or falls below, 850°C when using non hazardous waste or hazardous waste where the content of halogenated organic substances (as chlorine) does not exceed 1%; or
- any continuous emission limit value in schedule 3 table S3.1 is exceeded due to disturbances or failures of the abatement systems, other than under 'WID abnormal operating conditions'.

### 2.1.15 PFO

2.1.16 Processed fuel oil will be used for kiln light ups. The PFO is a product and therefore not subject to the controls under the waste incineration directive. The PFO will be a direct replacement for gas oil.

- 2.1.17 The PFO will be supplied to the agreed specification, the supplier will be responsible for ensuring full compliance with the requirements of the PFO quality protocol.
- 2.1.18 During kiln light ups oil is used to heat the kiln system for two principal reasons; to dry out newly installed refractories and to achieve a sufficiently high temperature in the kiln tube so that coal can be burned. Once this point is reached in the light up the abatement plant is expected to be operating normally

## **C2.2 Other techniques and abatement**

- 2.2.1 There will be no change to the operation of the abatement equipment on kiln 7 as a result of using PFO, SRF and RFO as fuels.

## **C2.3 Operating techniques**

- 2.3.1 The introduction of SRF and RFO will not require any significant changes to the Hanson Cement certified management system. The operation and use of SRF and RFO will be covered by an environmental aspect assessment. A hazard and operability (HAZOP) study of the SRF and RFO installations will be undertaken so that any risks arising from the use of these fuels are identified and controlled.
- 2.3.2 The HAZOP study carried out for the initial use of MBM on the calciner will be reviewed to include the use of MBM on the kiln main burner.
- 2.3.3 The operation of the SRF, RFO, MBM tyre and Cemfuel systems will continue to comply with condition 2.3 of the existing EPR permit EPR/BL7272IB/V006.
- 2.3.4 All staff at Ribblesdale, whose duties will involve the operation of SRF, RFO and MBM will have their training needs assessed and recorded in the training matrix. The training programmes will be developed to ensure the operation of the use of the fuel feed systems is safe, and all reasonable steps have been taken to protect the environment.
- 2.3.5 The operations at Ribblesdale Works are subject to routine auditing by both internal and third party auditors. The Works is part of the company integrated management system which is certified to ISO14001:2004 Environmental Management System, BS OHSAS 18001 Health and Safety Management System, and ISO9001:2000 Quality Management System.
- 2.3.6 The use of PFO as a light up fuel may require some trace heating of the delivery lines

## **C2.4 Ground Water Protection**

- 2.4.1 The SRF plant will be built on a concrete surface and any spillages will be promptly removed and returned to the process. Thus there is no potential for SRF handling to impact on groundwater.
- 2.4.2 The RFO and PFO tank(s) will be bunded with the bund being capable of containing 110% of the contents of a full tank.

## **C2.5 Raw Materials**

### **2.5.1 SRF**

- 2.5.1.1 SRF will be produced offsite for Hanson Cement. Supply contracts will be agreed with all potential suppliers of SRF to ensure the chemical composition of SRF will comply with the specification given below:-

**Table 2.5.1.1 Composition of SRF**

<b>Parameter</b>	<b>Maximum Value</b>
Calorific Value	10 – 40 MJ/kg
Sulphur	2.0 % w/w
Chlorine	2.0 % w/w
Total Fluorine, Bromine and Iodine	1.5%
Mercury	10 mg/kg
Total Group II metals	30 mg/kg
Copper	500 mg/kg
Lead	300 mg/kg
Total Group III metals	800 mg/kg

This specification is taken from the Environment Agency's standard waste derived fuel specifications for solid wastes.

- 2.5.1.2 As the SRF is waste the duty of care requirements as set out in EPR permit EPR/BL7272IB/V006 condition 2.3.3 will apply.
- 2.5.1.3 Procedures will be developed to enable sampling of the SRF burnt on the kiln. Samples will be tested to ensure conformity with the specification in the table above.
- 2.5.1.4 The SRF will be used to provide up to 60% of the kiln 7 fuel consumption on an hourly basis, this equates to approximately 152,200 tonnes per year. This represents all the fuel used in the calciner, in practice the use of SRF on an annual basis will not be as high as this. However, Hanson Cement requires the flexibility to switch from one fuel to another depending upon availability and other commercial considerations.
- 2.5.1.5 The remaining fuel input will be provided by coal, Cemfuel, MBM, chipped tyres, and RFO at various percentages up to the specified replacement value authorised for each individual fuel, as set out in table S2.2 of the EPR permit.

## **2.5.2 RFO**

2.5.2.1 The RFO will be produced off site for Hanson Cement by specialist fuel recovery companies. The chemical composition of RFO will comply with the specification given below:-

**Table 2.5.2.1 Composition of RFO**

<b>Parameter</b>	<b>Maximum Value</b>
Calorific Value	30 – 48 MJ/kg
Sulphur	2.0 % w/w
Chlorine	2.0 % w/w
Total Fluorine, Bromine and Iodine	1.5%
Mercury	20 mg/kg
Total Group II metals	40 mg/kg
Copper	1000 mg/kg
Lead	800 mg/kg
Total Group III metals	1800 mg/kg

This specification is taken from the Environment Agency's standard waste derived fuel specifications for recovered fuel oil.

2.5.2.2 Procedures will be developed to enable sampling of the RFO burnt on the kiln. The samples will be tested to ensure conformity with the specification in the table above.

2.5.2.3 The RFO will be used to provide up to 40% of the kiln 7 fuel consumption on an hourly basis, this equates to approximately 22,000 tonnes per year. This represents all the fuel used in the kiln main burner, in practice the use of RFO on an annual basis will not be as high as this. However, Hanson Cement requires the flexibility to switch from one fuel to another depending upon availability and other commercial considerations.

2.5.2.4 The remaining fuel input will be provided by coal, Cemfuel, MBM, chipped tyres, and SRF at various percentages up to the specified replacement value authorised for each individual fuel, as set out in table S2.2 of the EPR permit.

2.5.2.5 The substitution of traditional fossil fuels in cement kilns with waste derived fuels is considered to represent Best Available Techniques as it does not increase emissions from the process, it prevents emissions from landfill and incineration, and it utilises materials that would otherwise have been treated as waste.

## **2.5.3 PFO**

2.5.3.1 The PFO will be produced off site for Hanson Cement by specialist oil recovery companies. The PFO will comply with the Environment Agency / WRAP Processed Fuel Oil Quality Protocol.

- 2.5.3.2 The PFO will be used for kiln light ups and will replace up to 400 tonnes of gas oil or kerosene a year.

## **C2.6 Waste**

- 2.6.1 The source screening, composition and control of SRF and RFO before it is dispatched to Ribblesdale ensures that there will be no waste arisings from the storage and handling of SRF and RFO on site. The composition of the fuels is such that they are entirely consumed within the kiln system. The organic matter will be fully combusted and the inorganic minerals will be incorporated in the clinker.
- 2.6.2 The alkalis and chloride will leave the kiln in the bypass dust. There is unlikely to be a change in the quantity of dust extracted in this manner, although there maybe a change in composition as a result of a change in alkali and chloride inputs when compared with the current kiln fuel mix. The impact of the SRF and RFO on bypass dust composition will be assessed during the commissioning phase of the project.
- 2.6.3 There will be small quantities of waste arisings from maintenance of the SRF storage and transport systems such as waste lubricating oils and replacement parts. These wastes will be disposed of as already described in section 2.5 of the PPC permit application.
- 2.6.4 There will be small quantities of waste arisings from maintenance of the RFO storage and transport systems such as rags, wiping cloths, PPE, and replacement parts. These wastes will be disposed of as already described in section 2.5 of the PPC permit application.
- 2.6.5 Any waste oil arising from site maintenance work will, where possible, be recovered through the RFO system.

## **C2.7 Waste recovery and disposal**

- 2.7.1 There will be no change to the disposal and recovery routes for waste arising as a result of the use of SRF and RFO.
- 2.7.2 By utilising SRF and RFO, there will be increased recovery of waste from other industry and a reduction in waste disposal via landfill and incineration.

## **C2.8 Energy Consumption**

- 2.8.1 The use of alternative fuels is a key part of the UK cement industry's climate change levy agreement. Achieving the sector agreement milestones is dependent upon a year on year increase in alternative fuel usage. The use of alternative fuels in the cement industry is recognised as being carbon neutral as the wastes used to make alternative fuel would have been incinerated producing additional carbon dioxide emissions or landfilled resulting in methane emissions. It should be noted that as a greenhouse gas, methane is 21 times more potent than carbon dioxide.

- 2.8.2 The energy consumed by the SRF storage and handling system will be unchanged as the SRF will replace tyre chips or MBM or coal. For each tonne of coal replaced, there will be a reduction in coal mill energy consumption for grinding. If MBM is replaced by SRF then the energy consumption of the SRF and RFO transport system is less than that of the MBM pneumatic conveying equipment.
- 2.8.3 The energy consumed by the RFO storage and handling system will be the same as the Cemfuel plant. The RFO will replace Cemfuel or coal leading to a reduction in coal mill energy consumption for grinding.

## **C2.9 Accidents**

- 2.9.1 As previously stated the SRF and RFO plants will be subject to HAZOP studies. The two plants will also be subject to a fire risk assessment.
- 2.9.2 The MBM plant HAZOP will be reviewed to include the new extraction and transport system to allow burning of MBM on the main kiln burner.
- 2.9.3 The works environmental accident management plan will be updated following the completion of the HAZOP studies and environmental aspects evaluations.

## **C2.10 Noise**

- 2.10.1 The SRF plant will be designed to minimise noise. All equipment will be specified to operate at or below 75 dBA.
- 2.10.2 The operation of the coal mills is 'noisier' than the proposed SRF handling equipment thus the reduction in coal milling will have a greater impact on reducing noise levels. However, there is unlikely to be a measurable change in noise levels at the off site monitoring points.
- 2.10.3 Thus reducing or eliminating the coal mill operating hours by using SRF, RFO, and other alternative fuels is considered BAT for minimising noise impacts.

## **C2.11 Monitoring**

- 2.11.1 The plant is equipped with permanent emission monitors as required by WID. The continuous monitors are calibrated periodically in accordance with the requirements of EN14181.
- 2.11.2 Ribblesdale works is required to undertake extractive stack monitoring for other emissions twice per year. This work is carried out by an MCERT accredited third party monitoring organisation using recognised methods agreed with the Environment Agency, as detailed in the EPR permit, unless these methods have been superseded by more recent CEN (European Standards), in which case the most recent methods will be used.
- 2.11.3 The Environment Agency are able to carry out their own testing to verify the results obtained by Hanson Cement's contractors. Furthermore, the Environment Agency will be able to audit the performance of Hanson's contractor at any time during the stack monitoring work.

- 2.11.4 Routine testing of SRF, RFO, and MBM composition will continue as outlined in 2.5. As part of the reception and handling procedures, weighbridge tickets for each delivery will be retained in accordance with the condition in the permit.
- 2.11.5 There is no additional monitoring of the use of PFO proposed as this represents a small fraction of plant operating time at low stack flow rates. The Continuous emissions monitors will be operational during light up.

**C2.12 Proposed technical evaluation programme**

- 2.12.1 The use of SRF as a fuel in the calciner and main burner, RFO as a fuel on the main burner and MBM as a fuel on the main burner and calciner will be trialled over a 4 week period. During this time continuous emission monitors will provide data on the main stack emissions.
- 2.12.2 Additionally during the technical evaluation two sets of extractive stack sampling will be undertaken for the species listed in the EPR permit. This extractive sampling will be carried out by MCERT accredited third party monitoring organisation.
- 2.12.3 The evaluation programme for the trial will be as shown in table 2.12.1 below.

<b>Table 2.12.1 Monitoring Programme</b>	
<b>Time</b>	<b>Monitoring</b>
Week 1	On site CEM data
Week 2	On site CEM data
Week 3	On site CEM data <b>and</b> extractive stack sampling by MCERT accredited third party
Week 4	On site CEM data

- 2.12.4 The monitoring and sampling programme for the technical evaluation will be as shown in table 2.12.2 below:-

<b>Table 2.12.2 : [SRF] Technical Evaluation Monitoring and Sampling programme</b>								
Substance or criteria to be measured	Minimum Number of Samples Required							
	Kiln Feed	Coal	SRF	MBM	RFO	Kiln Stack A2	Clinker	Bypass dust
Total Particulates						C + 1		
>PM10						1		
<PM10 >PM2.5						1		
<PM2.5						1		
NOx (as NO <sub>2</sub> )						C		

SO <sub>2</sub>						C		
CO						C		
HCl						C		
HF						1		
Ammonia (if SNCR used)						C		
VOC (as TOC)						C		
Group I, Group II, Group III metals	2	2	2	2	2	3	2	2
Total of each S, F, Cl, Br, I	2	2	2	2	2		2	2
Dioxins and Furans						3		
PCBs						3		
Moisture, Temp., and O <sub>2</sub>						C		
Flow	C	C	C	C	C	ExT		
Calorific value (gross and net)		2	2	2	2	2		

C - Continuous measurement

1 – single extractive sample

2 – two periodic extractive samples

ExT Stack flow measured during extractive testing of other parameters e.g. Dioxins

<sup>(1)</sup> Metals means – mercury, cadmium, thallium, antimony, arsenic, cobalt, copper, chromium, lead, manganese, nickel, and vanadium.

2.12.5 On completion of the technical evaluation the use of SRF, RFO and MBM on kiln 7 will continue whilst a report is prepared and submitted to the Environment Agency. The report will compare the results from the continuous emission monitors during the period of the technical evaluation and the extractive stack sampling results together with a comparison with historic continuous and extractive sampling results. The report will be submitted within 2 months of completion of the technical evaluation.

### **C2.13 Decommissioning**

2.13.1 The use of SRF and RFO does not require any changes to the decommissioning information provided in the PPC application.

### **C2.14 Multi operator sites**

2.14.1 Hanson Cement is the only operator on the Ribblesdale site

### **C3 Proposed Emissions**

3.1.1 The emissions from kiln 7 will be unchanged from those given in the PPC application and reproduced below in table 3.1. The best available techniques associated emission level (BATAEL) standards are taken from the Environment Agency Cement industry draft EPR 3.01a guidance note. Emissions of NO<sub>x</sub> and

particulates are currently under review as part of improvement conditions set in the recently issued permit variation.

3.1.2 All figures are reported as dry gas, corrected to 10% oxygen and 1.013 bar pressure.

Emission	BATAEL mg/Nm <sup>3</sup>	Emission limits mg/Nm <sup>3</sup>	Typical Kiln 7 performance
NO <sub>x</sub>	200-450	800	400-800
SO <sub>2</sub>	50-400	200	0-200
Particulates	<10-20	30	20-30
Carbon monoxide	No indicative standard	2000	700-1500
Hydrogen Chloride	10	10	5-10
Hydrogen Fluoride	1	1	<0.1
Mercury	0.05	0.05	<0.01
Cadmium and thallium	0.05	0.05	<0.02
Group III metals*	0.5	0.5	<0.3
Dioxin ng/Nm <sup>3</sup> TEQ	0.1	0.1	<0.1

\* This limit is the sum of the following metals: antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel, and vanadium.

3.1.3 The emissions from the SRF, RFO, and MBM storage and handling systems are considered to be negligible.

3.1.4 Emissions during light ups arising from the use of PFO will similar to those when using gas oil or kerosene with the exception of sulphur dioxide which will increase as a result of the higher sulphur content in PFO.

#### **C4.1 Assessment of impact**

4.1.1 The impact assessment provided in the PPC application has demonstrated that kiln 7 has a negligible environmental impact. Similarly the impact assessment submitted after the introduction of MBM demonstrated there had been no significant change in emissions with the exception of the reduction in carbon dioxide emissions.

- 4.1.2 In terms of kiln stack emission there will be no change in emissions as a result of the use of SRF and RFO.
- 4.1.3 The major benefit of using biomass fuels such as SRF, and MBM is the reduction of carbon dioxide emissions. The emissions of CO<sub>2</sub> are measured in global warming potential (GWP), this measure converts more potent green house gases such as methane and nitrous oxide to an equivalent amount of CO<sub>2</sub>.
- 4.1.4 The overall environmental impact of using SRF in the cement process is illustrated in the table below which assumes 20,000 tonnes of SRF is used per year, replacing an equivalent amount of coal. The difference between the amount of coal and SRF is due to the variation in energy content, SRF having a typical calorific value of 18 MJ/Kg and coal 24 MJ/kg.
- 4.1.5 Use of SRF in the cement making process also reduces green house gas emission from landfill. In a landfill SRF will decompose to produce methane, carbon dioxide and water. Not all the methane produced will be collected and burned at the landfill to produce carbon dioxide. In practice some methane, which has a global warming potential of 21 times that of carbon dioxide, will be emitted. Thus the assessment below presents an under estimate of the base line releases.
- 4.1.6 SRF is approximately 50% biomass, thus there is a significant reduction in CO<sub>2</sub> emissions compare with the coal only operation.

<b>Table 4.1 Environmental balance sheet</b>			
	Unit	waste disposed of to landfill	SRF as kiln fuel
SRF waste to landfill	Tonnes	20,000	0
Fossil fuel (coal) used in kiln	Tonnes	15,417	0
Carbon Dioxide from kiln fossil fuel	Tonnes	34,762	0
Carbon dioxide from SRF combustion in kiln	Tonnes	-	16,092
Carbon Dioxide from landfill (assumes 90% of carbon in SRF is emitted CO <sub>2</sub> )	Tonnes	14,482	0
Methane emitted in landfill of SRF	Tonnes	439	0
GWP methane emission	Tonnes	9,220	0
<b>Total GWP</b>	<b>Tonnes</b>	<b>59,464</b>	<b>16092</b>

4.1.7 The transport of SRF and RFO to Ribblesdale will be lower than the emissions from the transportation of coal to the site due to the short distances involved in the transport of RFO and SRF. Although at present coal is delivered by ship, rail and road, the emissions from transport are very small compared with the production process. However, the substitution of coal will result in a reduction of methane emissions from coal mining, which can have a significant impact on green house gas emissions.

#### **4.1.8 Recovered Fuel Oil (RFO)**

4.1.9 Replacing coal with RFO does not have as significant benefits as RFO is a fossil fuel, there is however a small reduction in CO<sub>2</sub> emissions as a result of the higher CV of RFO and lower carbon emission factor (greater hydrogen content of the fuel). If 20,000 tonnes coal were used the CO<sub>2</sub> emission would be 45,096 tonnes, using RFO to provide the same thermal input to the kiln would lead to CO<sub>2</sub> emissions of 34,445 tonnes.

4.1.10 The main benefit of using RFO is the recovery of the energy in the cement process.

#### **4.1.11 Processed Fuel Oil**

4.1.12 As PFO is replacing gas oil or kerosene there is no a significant change in CO<sub>2</sub> emissions from its use. The principal reason for using PFO is to reduce operating costs as PFO is less expensive than gas oil.

4.1.13 PFO has a higher sulphur content than gas oil, typical sulphur levels are around 0.5%, In a typical year the plant consumes around 400 tonnes of kerosene, thus mass release of SO<sub>2</sub> is expected to increase by about 4 tonnes per year or just under 4%

4.1.14 As light ups are only a short duration the impact of SO<sub>2</sub> emissions has been considered in terms of short term air quality standards. The PFO specification limit is 1% therefore the potential impacts of PFO use for kiln light ups has been assessed at the limit value.

4.1.15 The potential impact of this sulphur content has been assessed using the H1 screening methodology. The duration of a kiln light up is between 24 and 48 hours although it may be longer if there has been a large amount of new refractory concrete installed.

4.1.16 Typically the maximum PFO flow rate during start ups will be 2000 litre/hour, this represents the worst case impact on air quality. A burner operating at 2000l/h of PFO will release around 33kg/h of SO<sub>2</sub> this is equivalent to a SO<sub>2</sub> release rate of 0.0091 g/s, using the stack height of 92 m the screening method predicts a maximum hourly ground level concentration of SO<sub>2</sub> of less than 0.1 µg/m<sup>3</sup>

4.1.17 The air quality objective is 350 µg/m<sup>3</sup> as an hourly average, the predicted maximum is less than 0.02% of this objective thus the potential impact of using PFO is considered negligible.

#### **C4.2 EU Waste Framework Directive 2006/12/EC**

- 4.2.1 The procedures implemented at Ribblesdale ensure that waste is recovered or disposed of in accordance with the relevant objectives contained within article 4 of the EU Waste Framework Directive 2006/12/EC, i.e.

*Member States shall take the necessary measures to ensure that waste is recovered or disposed of without endangering human health and without using processes or methods which could harm the environment, and in particular:*

*(a) without risk to water, air or soil, or to plants or animals;*

*(b) without causing a nuisance through noise or odours;*

*(c) without adversely affecting the countryside or places of special interest.*

*Member States shall take the necessary measures to prohibit the abandonment, dumping or uncontrolled disposal of waste.*

- 4.2.2 The existing waste management procedures will be applied to the storage and handling of SRF and RFO.

- 4.2.3 Bypass dust produced at the installation is recovered by land spreading on suitable agricultural sites approved by the Environment Agency.

### **C4.3 Habitats**

- 4.3.1 The air quality assessment presented in the PPC application has demonstrated that Ribblesdale works has a negligible impact on SSSI, SAC and SPA sites. The use of SRF and RFO will not result any detrimental change in emissions and consequently there will be no impact on these sites.

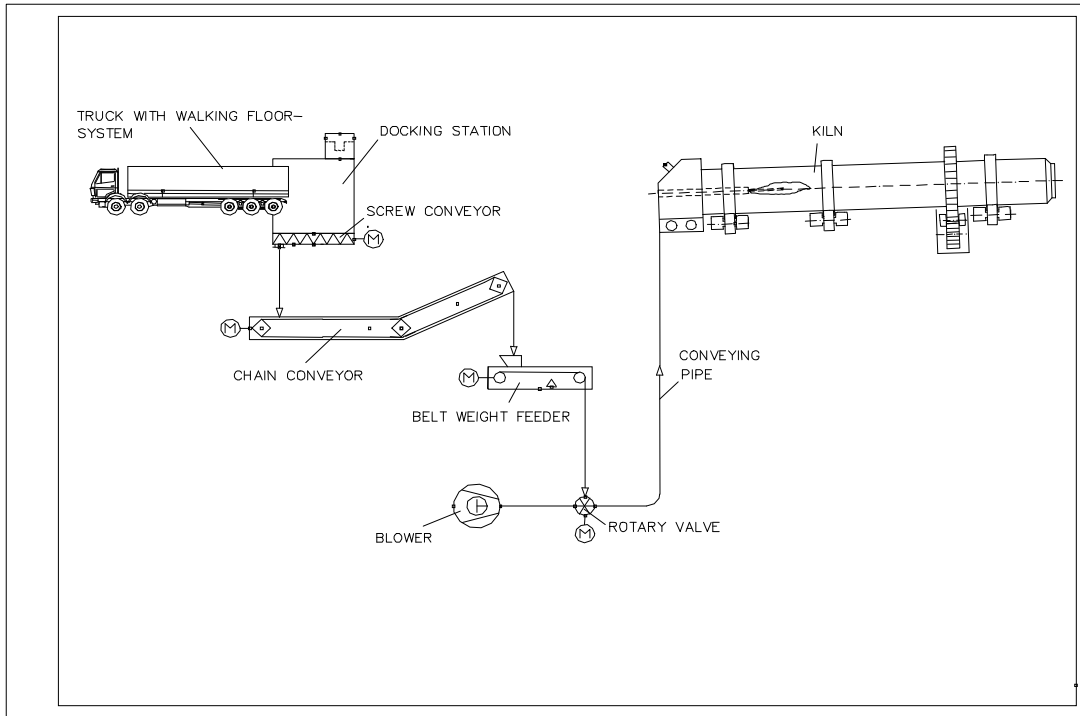
### **C5 Environmental Statements**

- 5 Copies of Environmental statements were submitted as part of previous applications. The PPC application in 2001 included a copy of the ES covering the development of Bellman Quarry in 1996. The PPC permit application of the Lanehead landfill included a copy of the Environmental Statement for the landfill development.

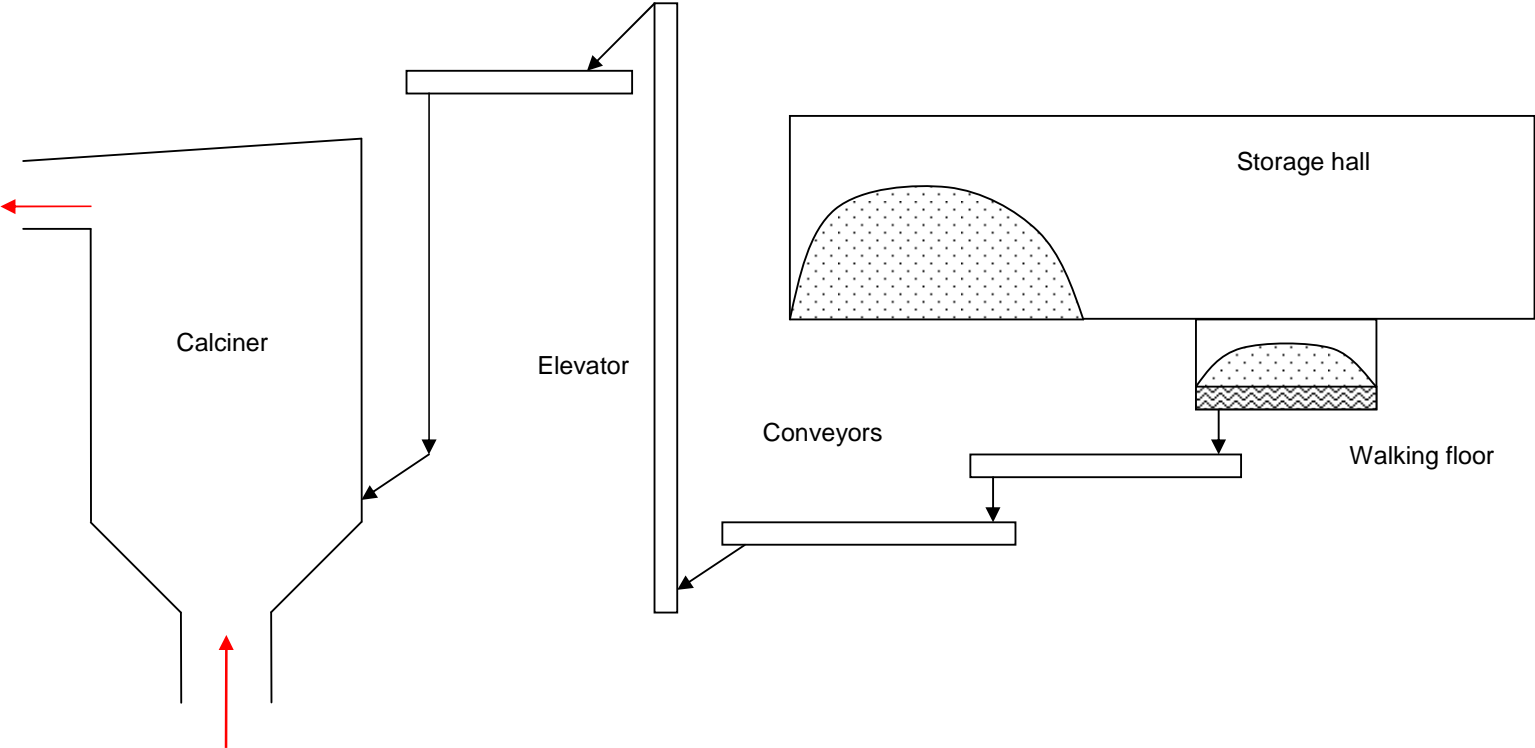
## Appendix 1

### Process flow diagrams of proposed SRF handling systems

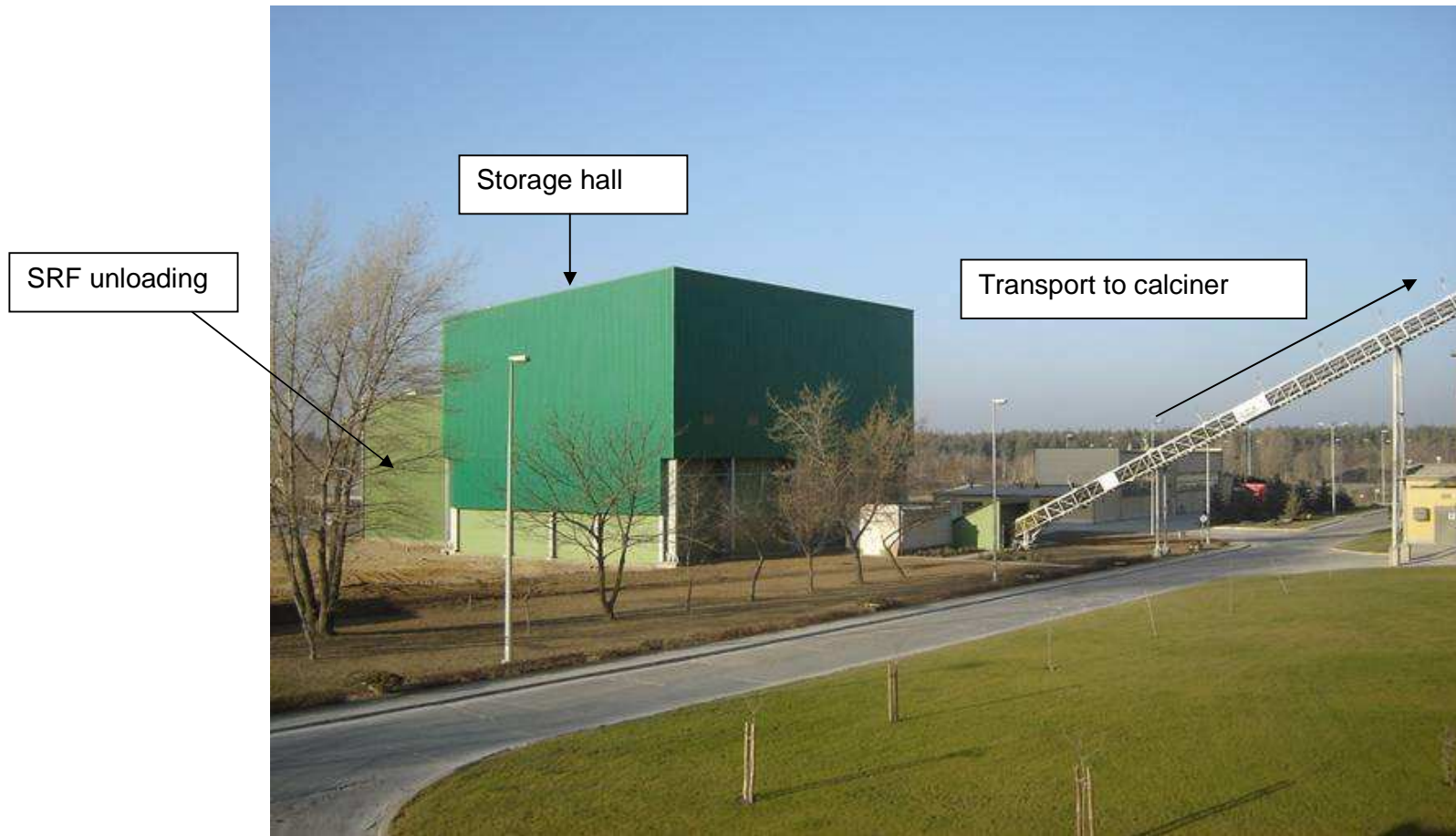
- A1.1 SRF feed to the kiln main burner
- A1.2 SRF feed to the kiln calciner
- A1.3 Installation of a storage hall and feed system for SRF at a European Heidelberg Cement plant



A1.1 SRF handling and feed to the kiln main burner



A1.2 SRF handling and feed to the kiln calciner



**A1.3 Installation of a storage hall and feed system for SRF at a European Heidelberg Cement plant**