NITROGÉNMŰVEK Rt.

N_2O emissions reduction project at the new acid plant at Nitrogénművek Rt.

Project Idea Note

July 2004

VERTIS
ENVIRONMENTAL
FINANCE

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1. GENERAL INFORMATION

1.1 Supplier data

Company name:	Nitrogénművek.
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Postcode:	8105
Postal address:	8105, Pétfürdő, Pf.: 450
Web site:	http://www.nitrogen.hu/
No. of Employees:	898
Location of Trade Register:	Pétfürdő
City:	Pétfürdő
Registration number:	19-10-000148
Date of registration:	1 February 1990
Bank account number:	10402908-29010644-00000000
Bank name:	Kereskedelmi és Hitelbank Rt.
Company's core business:	Fertilizer production
Tax number:	10325957-2-19
Country:	Hungary
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Job title:	Technical Manager, Assistant General Manager
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1.2 Corresponder's data

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2. PROJECT INFORMATION

2.1 Key data of the project

- Project Title: N_2O emissions reduction project at new acid plant in Nitrogénművek Rt.
- Country: Hungary
- Location of Investment: Pétfürdő

2.2 Project definition

The Nitrogen Works Chemical Industry Corporation (hereinafter referred to as Nitrogénművek, or Company), the only industrial nitrogen fertilizer production facility in Hungary, plans to install a N_2O emissions reduction catalyst into its new weak acid plant, conforming BAT requirements. The present project idea note focuses on the N_2O emissions reduction catalyst to be installed in the new acid plant, as well as the technological modifications necessary for its installation and operation (hereinafter referred to as the Project).

2.3 Project summary

The catalyst to be implemented in the new acid plant will reduce the N_2O content of the tail gas by 85% (to 150 ppm) as a result of catalytic processes taking place at medium temperature (400-500°C). Installed in the waste gas treatment reactor, the catalyst will need additional ammonia feed for its operation.

The plans of the implementation of the new acid plant is already known, but the decisions concerning the installation of the catalyst depends on the participation in emissions trading. The significant milestones related to the new acid plant are as follows:

- Date of decision making on the establishment of the new acid plant — January 2004
- Concluding an agreement with the main contractor — September 2004
- Start of construction — January 2005
- Start of the catalyst's construction — January 2006
- Start of business activity — October 2006

Data concerning the Emission Reduction Units (ERUs) to be delivered:

- Period of claim on Emission Reduction Units (ERUs) — 1 January 2008 - 31 December 2012
- The estimated total claim on ERUs to be delivered — 3.5 million ERUs

2.4 Background

2.4.1 History of Nitrogénművek

Nitrogénművek was founded on 1 January 1990, with its production capacities located on the Pétfürdő site. The company's main activity is fertilizer manufacturing, including mostly nitrogen-based products.

The beginning of fertilizer production in Pétfürdő dates back to the early 1930's when the company's operation was launched upon a government initiative. Following the merger of the ammonia and fertilizer plants in the form of corporation in 1933, the corporation continued its operation under government control and supervision. After World War II. the development and the expansion of the company was regarded as high priority by the state. The large capacity new fertilizer factory, which was built in 1975, significantly changed the structure of the domestic fertilizer production industry. From the 1970s, the company was facing more and more significant financial challenges, which lead to bankruptcy proceedings by the end of the 1980s. During the liquidation process, the assets of the company were bought by companies, banks and institutes that had significant claims on the Company.

Nitrogénművek started its operation in its present structure on 1 February 1990. The company was stabilised through the development of new strategies, the restructuring of the product portfolio and the modernisation of the organisation. Nitrogénművek has been operating profitably since 1994. As of 1995, a medium term modernisation project was launched. It was primarily devised for energy rationalisation, capacity increase and improvement of product quality. The market policy focused on satisfying the domestic demand for nitrogen fertilizers, however, the company is also involved in some export activities for the continuous and balanced operation of its production capacities.

Nitrogénművek is the only Hungarian nitrogen fertilizer producer, having an approximately 60% share in the market of nitrogen fertilizers. The most important raw material for fertilizer manufacturing is ammonia, which is prepared and processed in Pétfürdő. The Company also produces other chemical products (nitric acid), industrial gases (argon, nitrogen), as well as sorbite and diabetic sweeteners.

2.4.2 Ownership

In 2002, the ownership structure of the company underwent a significant change: Bige Holding Invest Kft. acquired the ordinary shares of the former two owners (MOL Rt. and Hydro Central Europe B.V.), registered as of 15 November 2002. The two new owners are László Tibor Bige and Zoltán Bige. They possess 95% and the 5% of the company's shares, respectively.

2.4.3 Necessity of the Project

The catalyst is capable of reducing the N_2O content of the tail gas to approximately 150 ppm (0.015 tf%) from an estimated 1000 ppm (0.1 tf%) tail gas emission of the new acid plant. Since there is no regulation about N_2O emission caps and the catalyst is not an essential part of the acid production process, the implementation of the Project is voluntary and serves only environmental purposes.

2.4.4 Current state

Currently Nitrogénművek is carrying out five kind of production activities whose phases are built upon one another. Correspondingly, acid production depends on the demand for fertilizer. The following table summarises the major production units and capacities of Nitrogénművek:

Table 1: The major production units and capacities of Nitrogénművek

Name of plant	Capacity
Ammonia plant	1200 t/day
Carbamide plant	600 t/ day
Nitric acid plant *	4x 350 t/ day + 270 t/ day
Pétisó plant	1500 t/ day
AN plant	600 t/ day

*Significant for N_2O emissions

Not only are the capacities of the individual plants interrelated, but the same availability of the plants is also necessary for the optimal utilisation of the manufacturing capacity. This condition is not met in the case of the acid plants, today obstructs the optimal operation of the whole production process. At present, Nitrogénművek operates four weak acid units, each with an individual capacity of 350 t/day. These facilities were built in 1975 on the basis of the technology provided by Russian company GIAP-Moscow. The acid plants produced 268 tons of weak nitric acid in 2003. The manufacturing data of the acid plant is summarised in the following table:

Table 2: The manufacturing data of the acid plant in the past few years

Raw materials used		1999	2000	2001	2002	2003
Ammonia	t	87,714	109,956	118,176	74,736	82,767
Natural gas	$thNm^3$	39,553	45,774	46,775	30,052	33,467
Acid produced	**t**	**289,700**	**363,315**	**388,999**	**243,593**	**268,902**

Current N_2O emissions

The historic N_2O emissions of Nitrogénművek are shown in the following table. The quantity of greenhouse gas N_2O, which has a GWP[1] of 296, is given in CO_2 equivalents. CO_2eq is also be used as the basis of calculations below.

[1] A Global Warming Potential, IPCC, 2001

Table 3: Historic N_2O emissions

Historic data		1999	2000	2001	2002	2003
Capacity (4*350 t/day)	t/day	1400	1400	1400	1400	1400
Annual acid production (measured)	t/year	289,700	363,443	389,158	243,638	268,902
Annual operating time	day	207	260	278	174	192
Quantity of acid produced	t/h	58.33	58.33	58.33	58.33	58.33
Quantity of tail gas per one ton of acid	Nm3/t	4800	4800	4800	4800	4800
Quantity of tail gas	thNm3/year	1,390,560	1,744,526	1,867,958	1,169,462	1,290,730
Average N2O concentration in tail gas (measured)*	ppmv	1370	1370	1370	1370	1370
Average quantity of N2O in tail gas	tf%	0.137	0.137	0.137	0.137	0.137
Annual N2O flow, volume	thNm3	1,905	2,390	2,559	1,602	1,768
Annual N2O amount	t	3,740	4,693	5,025	3,146	3,472
N2O emission factor**	CO2e	296	296	296	296	296
Annual CO2e emission	**tCO2e/year**	**1,107,166**	**1,388,995**	**1,487,272**	**931,128**	**1,027,682**

* Measurement period: 2004.03.-2004.06.
** Source: IPCC 2001

The present acid plant does not use any N_2O emissions reduction technology. 100% of N_2O produced in the course of the chemical reactions of acid production is emitted. A N_2O measuring instrument was installed in the facility in March 2004, thus, besides NO_x, the quantity of this gas has been measured continuously since that time. Moreover, the O_2, NH_3, and CO content of the tail gas is also measured regularly.

The amount of historic N_2O emissions cannot be specified by calculation, because the diversity of reactions taking place makes it impossible. Since the technology and the major parameters have not changed in the period examined (1999-2003), we can assume that the amount of N_2O in the emitted gas was similar to the amount registered in the measurement period. This assumption is also supported by the data concerning a similar acid production technology included in the BAT reference document (BREF)[2]. According to this document, the N_2O emission of various technologies ranges between 300 and 1700 ppm.

2.4.5 Background to development

By the periodical replacement of the main equipment of the acid plant, the plant could continue to operate for 8-10 more years, but considering the increasing costs of replacement, the economic results would deteriorate continuously. In order to preserve the competitiveness of Nitrogénművek and sustain the continuity of production, the company’s management decided on the more economical and reasonable solution of replacing the old nitric acid and pétisó (fertilizer) plants with new facilities, because the current technological level is unsatisfactory and the maintenance costs are high. Thus, the company will decommission the plant in 2006 and establish, as a greenfield investment, a new acid production facility fully complying with the present technological and technical requirements. The design, permitting and implementation processes of the acid plant investment and the Project will take place simultaneously.

The following table summarises the technical parameters before and after the establishment of the new acid plant:

[2] Integrated Pollution Prevention and Control, Seville, March 2004

Table 4: The comparison of the main parameters of the existing and the new acid plants

		Existing plant	New plant
Technical parameters			
Pressure		Single pressure	Dual pressure
Tail gas reduction*		NSCR	SCR
N2O reduction catalyst		no	yes
Equipment**		pneumatic	DCS
Capacity	t/day	4x350	1500
Acid concentration	%	58	60
Pressure of steam output	bar	14	40
Specific material and energy consumption indicators			
Ammonia	kg/t	305	281
Cooling water	m3/t	200	129
Precious metal catalyst	mg/t	60	40
Electricity	kWh/t	26	11
Natural gas	Nm3/t	140	-
Steam output	t/h	1.4	0.6

*NSCR: Non-Selective Catalytic Reduction
SCR: Selective Catalytic Reduction
** DCS: Distributed Control System

The construction of the catalyst in the new facility depends on the company's participation in emissions trading.

2.4.6 Implementation

The catalyst technology Nitrogénművek wishes to apply is currently used by a German and a French company, with whom the negotiations are already in process.

The equipment of the new acid plant to be created should be designed in the planning phase with a view to the catalyst to be installed. The installation and the commissioning are expected to be done by the main contractor.

The design, implementation and operation of the catalyst to be installed for the purposes of reducing N_2O emissions will involve additional costs.

2.4.7 Commercial and legal background of fertilizer sales

Since both acid production and N_2O generation depend on the fertilizer market completely, we will focus on the current and expected future situation of the fertilizer market in our market analysis.

The current market position of Nitrogénművek

The product portfolio of Nitrogénművek is dominated by fertilizers, which represent about 90% of the total corporate production, expressed as a percentage of sales revenues. The only Hungarian company that produces nitrogen-based substances is Nitrogénművek. The domestic market also can be supplied with nitrogen-based materials by imports. In 2003, the company's domestic fertilizer sales amounted to a total of 155 thousand tons as calculated in nitrogen ingredients, resulting in a net sales of

22,900 million HUF, which was 444 million HUF higher than the income generated in 2002.

The significant decrease in production in 2002-2003 was caused by the abolishment of customs tariff, that protected the market, as a result of which Hungarian domestic production fell, mainly due to fertilizers imported from the Ukraine. After the restoration of the customs supplement as of 2003, the production started to recover again.

Export sales is mainly based on solid fertilizers, within which carbamide is the most important product. The 2003 export revenue of the company was 4,825 million HUF, which was 13.7% higher than the corresponding data of the previous year. The most significant target countries of export were Austria, Germany, Italy, Yugoslavia, Bosnia-Herzegovina and Slovenia. In order to strengthen its presence in the foreign markets, the company founded a company in Serbia in 2003.

Hungarian fertilizer consumption is in line with the seasonal demand of the agricultural sector. 75-80% of the annual amount consumed is used in spring, while the rest is needed for the autumn agricultural work. Nevertheless, production is carried out continuously in Nitrogénművek, only paused for the long summer break. The company possesses a commercial network that provides a strong financial background and sufficient storage capacity, thus, Nitrogénművek is capable of keep a large stock outside the summer and fall season.

The relationship between Nitrogénművek and the authorised dealers belonging to the distribution network established for the domestic sales of fertilizers is regulated in a mutually advantageous, long-term Cooperation Agreement. The company concludes monthly contracts for transportation, deposit, sales and storage within the scope of the Cooperation Agreement.

The estimated market position of Nitrogénművek

After the accession to the European Union, the anti-dumping duty levied by the Community can protect domestic products from the cheap eastern imports. Since it is a strategic issue for the European Union to sustain an acceptable level of agricultural production, and thus fertilizer production, the anti-dumping duty will ensure an appropriate protection against cheap, mainly eastern fertilizers in the long run.

Nitrogénművek endeavours to keep its market leading position in the nitrogen fertilizer supply of the Hungarian agriculture in the long run. To establish an optimal production structure, the company only exports the quantity that – above the amount distributed in the domestic market – can still be sold at a profit at foreign markets. Nitrogénművek wishes to maintain its domestic market leading position by the maximum utilisation of its production capacity, a price policy tailored to market demand, the supply of high quality products and the sustainment of the current distribution network. At present, Nitrogénművek has a 60% share in the domestic market of fertilizers, and its strategic aim is to reach and sustain a 65-70% market share in the long run.

Nitrogénművek intends to keep the proportion of export revenues at around 20% within its total sales. The main target markets of the foreign sales activity are the neighbouring countries, with placing the emphasis gradually on the southern countries.

Table 5 shows the estimate on Hungarian fertilizer consumption included in the study prepared by the Agricultural Research and Information Institute (AKII). In order to keep our calculations conservative, we will use a forecast which is based on a pessimist approach assuming unfavourable conditions for the sector.

Table 5: The estimated consumption of nitrogen-based fertilizers in Hungary until 2012

(thousand tons)

Product	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
AN 34	515	524	534	545	555	566	582	600	618	636	656	675	695
Pétisó	81	82	84	85	87	89	91	94	97	100	103	106	109
Carbamid	82	84	85	87	89	90	93	96	99	102	105	108	111
Nitrosol	80	81	83	84	86	88	90	93	96	99	102	105	108

Source: IFA, Sectoral Economy Department

Hungarian agriculture is characterised by insufficient profitability at present, as a result of which producers are obliged to impose strict measures of economy. Considering the fact that the cost of fertilizers accounts for a significant part (35-40%) of the production costs, the economies producers are forced to make have a considerable effect on fertilizer consumption. After Hungary's accession to the European Union, the profitability of the agriculture is expected to approach the EU level gradually, thus, we can forecast a gradual development in fertilizer consumption as well.

2.4.8 Major contracts of Nitrogénművek

Natural gas supply

A concentration process has taken place in the supplier market of Nitrogénművek in the past few years. The most important partner was natural gas supplier MOL Rt, which delivered 342.5 million m^3 natural gas, with a total value of 12.46 billion HUF in 2003. The cost of natural gas accounted for 80% of the material costs of Nitrogénművek in 2003. Besides natural gas, Nitrogénművek also bought oil from MOL Rt. Until 2003 natural gas could only be purchased at a fixed price from the supplier (the Gas Supply Branch of MOL Rt) specified by the relevant legislation. As of 1 January 2004, the natural gas market was opened and fuel can now be acquired under free market conditions. From 1 January 2004 about 80% of the natural gas demand of Nitrogénművek is satisfied from import and 20% from domestic sources. The stability of import supply is ensured by long-term agreements.

Agreement on electricity supply

Electricity represents the second largest item among material costs. This accounted for 8.6% of material costs, with a total value of 1,333 million HUF in 2003. Since 1 January 2003, large consumers have been allowed to buy electricity on the free market, thus, the company has been purchasing electricity from MVM Partner Rt. through supplier ÉDÁSZ Rt. as of 1 April 2003.

Procurement

The additional significant agreements concluded by the company are connected to the raw materials and equipment that largely influence the operation of Nitrogénművek. These procurement include the purchase of precious metal catalyst grids necessary for the operation of the acid plant, to be delivered continuously throughout the year. Other components of significant value are usually purchased during the main summer maintenance period. Nitrogénművek concludes skeleton agreements with regular material, machine and component suppliers, as well as specific agreements on individual orders.

Maintenance

Nitrogénművek enters into agreements on maintenance, refurbishment and investment projects continuously.

2.4.9 Major risks during the implementation of the project

The implementation of the new nitric acid plant

The installation of the catalyst depends on the establishment of the new nitric acid plant, therefore, if the acid plant investment falls through (e.g. the company cannot find an investor), the project cannot be carried out as planned or it might fail completely.

Market risk

Since the manufacturing processes of Nitrogénművek are closely interrelated, the quantity of N_2O generated depends on acid production and also on fertilizer production, so it is recommended to look at the market risks from the perspective of the end product.

Nitrogénművek does not have long-term agreements in place for fertilizer sales. The cooperation agreements concluded with authorised dealers usually become effective in July and remain in operation for only a year. Section 2.4.7 deals with the current and estimated market position of fertilizers in detail.

Nitrogénművek decided on the implementation of the new, higher-capacity acid plant investment on the basis of its market research prepared in 2001. After Hungary's accession to the European Union, the expected export-import rate and the market demand cannot be seen clearly yet. Since acid production (thus, N_2O emission) is dependent on the demand for fertilizers, the change of the market involves a considerable risk for the amount of N_2O emission reduction.

Legal risk

The environmental laws and regulations of Hungary have already been harmonised with EU legislation. However, these regulations, such as Decree No. 14/2001 (V.9.) KöM-EüM-FVM, Decree No. 21/2001 (II. 14.) Korm and Decree No. 23/2001 (XI.13.) KöM, do not contain any provisions with regard to N_2O emissions. According to information provided by the Ministry of Environment and Water Protection (KvVM), no emissions caps will be specified in the foreseeable future. Nevertheless, in the event the air protection regulations of the EU should change and impose constraints on N_2O emissions, Hungary will be obliged to adapt to these changes. This may entail a risk in the long run.

The BAT reference document for acid production is being elaborated; its completion will be a result of several years' industrial cooperation, which process is still in its initial phase. The currently available working document sets out two N_2O emission reduction possibilities. (1) A catalytic process occurring at high temperature (850-950°C). Catalyst is placed in the oxidation chamber after the platinum catalyst used for the combustion of ammonia. (2) A catalytic process occurring at medium temperature (400-500°C). Catalyst is placed in the waste gas treatment reactor.

It is important to note that the BAT of a given facility does not necessarily represent the most modern techniques and technologies available, but the economically most reasonable ones that can ensure an appropriate level of environment protection. The installation of catalysts serving the purpose of N_2O emissions reduction is only an option at present, it is not obligatory.

The competent authority does not prescribe the use of a specific technology, thus, the environment users are to show and prove how much the equipment and technology applied fulfils the BAT requirements.

Currently, it is only in France that regulations concerning the reduction of N_2O emissions are in place. The maximum amount allowed in tail gas is 7 kg/t acid (~1100 ppm), which is meant to be reduced to 2 kg/t (~300 ppm) acid within 5 years. This strict regulation can be justified by the fact that France needs to impose these N_2O reduction measures in order to meet its obligations arising from the Kyoto Protocol. Owing to the changes occurring in the individual industrial sectors after the shift to market economy, Hungary does not need to impose any emission reduction measures in order to achieve its targets under the Kyoto Protocol until 2012, thus, no regulations pertaining to N_2O emissions can be expected.

Environmental risk

The installation of the catalyst will reduce N_2O emissions significantly, which is considered an additional value from an environmental point of view. The construction of the catalyst does not involve any environmental risks.

Construction risk factors

The company carrying out the construction work will be selected on the basis of a tender. As the most important condition of selection, the companies supplying the equipment and carrying out the construction work must have appropriate references in the field of building acid production facilities, thus, the risk arising from construction can be reduced.

Technological risk

Only experimental technologies exist for the reduction of N_2O emissions and the industrial scale technology operates in only one facility (Agrolinz, Austria) at present. The process is not an organic part of either the existing or the planned technology, therefore, Nitrogénművek takes a technological risk by the construction of the catalyst ensuring N_2O reduction.

Operational risk

Since the catalyst to be installed by Nitrogénművek is a separable part of the technology, its failure will not affect the technology of acid production considerably, although it will result in increased N_2O emissions. The equipment may involve an operational risk due to its novelty, but this risk can be reduced through the continuous experiences gained.

2.5 Financing

2.5.1 Investment financing

The Project would be financed exclusively from emissions trading sources. The estimated investment cost of the Project is EUR 1.5 million.

2.5.2 Operation

The operation of the catalyst involves an annual cost of about 70 million HUF – based on 2004 prices. It comprises mainly the costs of ammonia and energy consumption necessary for the operation of the catalyst. It is estimated that approximately 1,400 tons of ammonia will be required for the annual operation of the catalyst, which will result in an additional cost of about 55 million HUF. The regular maintenance costs will amount to 10 million.

2.5.3 Financial negotiations

The Project will be carried out in parallel with the new acid plant investment, so the negotiations on the financing of the two investments will also be conducted simultaneously. At present, Nitrogénművek is negotiating with two commercial banks, which are expected to co-finance the whole investment through a syndicated loan. The emissions trading revenues arising from the Project may contribute to a positive decision concerning the loan.

2.6 N_2O generation during acid production and reduction methods

The place of N_2O generation within the whole acid production process is shown below. The technology of acid production can be broken down into the following main steps:

1. ammonia oxidation (combustion);
2. absorption;
3. tail gas purification.

The oxidation of ammonia and the absorption can occur at low (1-3 bar), medium (4-7 bar) or high (8-12 bar) pressure. Low pressure and high pressure support oxidation and absorption, respectively. From a technological point of view, the technology is optimal if combustion occurs at low pressure and absorption at high pressure. This so-called dual pressure technology includes an intermediate compression between the two stages. The present acid plants of Nitrogénművek are of single pressure, where combustion and absorption occur at the same medium pressure of 5-6 bars. During the oxidation of ammonia, a 1:9 mixture of ammonia and air is driven through a catalyst, where the following reactions take place:

I. $4NH_3 + 5\,O_2 = 4\,NO + 6\,H_2O$
II. $4\,NH_3 + 3\,O_2 = 2\,N_2 + 6\,H_2O$
III. $\mathbf{4\,NH_3 + 4\,O_2 = 2\,N_2O + 6\,H_2O}$

The reactions take place on a platinum catalyst at a temperature of 890 ^{0}C in a way that prevents side reactions II and III from occurring as much as possible, because these reactions have a negative effect on the rate of NO generation. Platinum may be alloyed with 5-10% rhodium to increase the life cycle of the catalyst and decrease its maintenance costs.

The NO generated in reaction I is further oxidised by the oxygen content of air:

IV. $2\,NO + O_2 = 2\,NO_2$

The water absorption of NO_2 results in the generation of nitric acid:

V. $\mathbf{3\,NO_2 + H_2O = 2HNO_3 + NO}$

We can see that N_2O is generated by reaction III, which takes place in parallel with reactions I and II. There are two technologies for the catalytic decomposition of N_2O, both of which are rather new, and there are no significant industrial experiences in connection with the use of catalysts.

(1) The first technology is a catalytic process taking place on a cobalt and ZrO_2 catalyst at high temperature (850-950°C). The catalyst is placed in the oxidation chamber below the platinum grids used for ammonia combustion, thus, it constitutes an organic part of the technological process. By means of this process, the amount of N_2O can be reduced to about 10%. No industrial experiences are available with regard to the use of such catalysts. Currently Nitrogénművek is carrying out an industrial experiment with this process, but the results of the experiment have proved to be unfavourable so far.

(2) A catalytic process taking place at medium temperature (400-500°C) can be achieved with another type of catalyst. This process is carried out in the waste gas treatment reactor, thus it can be separated from the acid production processes. This type of catalyst has already been used in the Linz plant (Austria), and the process can be regarded as successful on the basis of the experiences so far.

According to experiences, the catalyst operating at a medium temperature can reduce N_2O emissions by 80-90%. Ammonia must be added for the catalytic processes, which involves the use of an additional 1,200 tons of ammonia annually. In the course of the chemical reactions, N_2O is decomposed into N_2 and O_2. The application of this technology does not result in any contamination of products or any loss of NO. A tail gas temperature below 400°C could obstruct the application of this method, since catalytic reactions would not take place at such temperature, but this will not be the case in the new acid plant to be established.

Under such circumstances, Nitrogénművek believes that the application of the high-temperature catalyst entails too much operational risk, so they regard the use of the medium-temperature catalyst as more probable.

2.7 Implementation plan

The main phases of the Project implementation (planning, permitting, construction, commissioning) will be carried out in parallel with the acid plant investment, so the implementation plan shows the two investments simultaneously.

Planned schedule		
1	Decision	January 2004
2	Start of loan negotiations	January 2004
3	Technical negotiations, visiting plants	March-May 2004
4	Negitiations with potential suppliers	June 2004
5	Selecting partner	July 2004
6	Submitting preliminary loan application	June 2004
7	Indicative loan offer	August 2004
8	Contracting with foreign supplier	August 2004
9	Submitting final loan application	August 2004
10	Concluding loan agreement	August 2004
11	Getting soil mechanics expert opinion done	July 2004
12	Submitting application for construction permit	July 2004
13	Construction permit	August 2004
14	Construction	January 2005 - August 2006
15	Date of installation of the catalyst *	January 2006
16	Technical commissioning	August 2006
17	Pilot run	September 2006
18	Commissioning	October 2006

* The implementation depends on the company's participation in emissions trading.

2.8 Permitting

The permitting process of the new acid plant will include the authorisation of the N_2O catalyst, therefore, we will examine these two investments together.

Building permit

In the case of this development, the competent permitting authority is the regional agency of the Hungarian Technical Safety Office, located in Székesfehérvár, as well as the first instance Construction Authority, i.e. both an establishment and a building permit must be obtained. Although there is no need for a separate environmental permit in this case, the environmental regulatory body also participates in the permitting process, since the environmental plan chapter constitutes an integral part of the construction permit.

For the reasons listed below, there is no need to obtain an environmental permit based on an environmental study for the implementation of the acid plant investment:

- no new activity is created from the investment;
- the investment does not qualify as significant modification of the existing activity, since the capacity will not be expanded by at least 25%; no technology or product change will take place; no new emissions subject to emission caps will be generated; the emissions subject to emission caps, earlier permitted, will not increase by a minimum of 25%.

The building permit documentation can only be completed after making a decision on all the technical issues and the selection of the technology suppliers. The duration of the official procedure for awarding the building permit is – theoretically – 60 days, but this may be prolonged in the case of issues involving complicated environmental consequences.

Utilisation permit

The competent technical safety and construction authority (augmented with the competent professional authorities, such as the first instance fire protection authority) shall specify the conditions of utilisation during the utilisation procedure of the building constructed on the basis of the authorised plan.

Operation permit

Operation permitting come within the competence of the operator itself, provided that it is not subject to any official permitting procedure by law. Prior to the commissioning of facilities, technologies, machines etc. that are deemed dangerous, an expert possessing the appropriate labour safety qualifications must conduct a 'preliminary labour safety examination', on the basis of which the operator is allowed to authorise the operation of the facility. Naturally, this can only happen after the completion of the investment and a test run procedure.

Warranty

The agreements to be concluded with the main contractor and the supplier of the equipment will also include the terms of warranty.

3. EMISSION REDUCTION

3.1 Baseline

The baseline question is: 'What would happen if Nitrogénművek did not invest in the Project, i.e. did not install the catalyst that reduces N_2O emissions?' The simple answer is: nothing would change, except the N_2O emissions would not be reduced by 90%. However as the establishment of the acid plant and the implementation of the Project will happen at the same time and they are closely interrelated, furthermore, as the revenues expected from emissions trading sources will largely influence the returns of the new acid plant; we consider the baseline issue in a wider context.

Nitrogénművek examined a number of development alternatives concerning the acid plant in order to evaluate its future perspectives. Of these scenarios, detailed investment plans were made for four strategic alternatives:

(1) Nothing will be done, the current state of the plant will remain unchanged, thus, the age of the – already outdated – acid production technology will be above 35 years.

(2) Nitric acid production will be stopped by shutting down the plant, which involves closing the whole factory, since the elimination of this production process will also disable the other interrelated manufacturing activities. In this case, the Project cannot be implemented. The domestic demand for fertilizers will be satisfied from foreign N_2O emitting facilities.

(3) An accepted acid production technology conforming to BAT will be implemented as a greenfield investment. It will not include the construction of a catalyst for N_2O emissions reduction.

(4) An accepted acid production technology conforming to BAT will be implemented as a greenfield investment, including the installation of a catalyst for N_2O emissions reduction.

Alternative (1) cannot be the baseline for the following reasons:

- The operability and technical condition of the existing acid plant could only be sustained by higher and higher refurbishment and maintenance costs; the equipment will soon reach the end of its useful operating time.
- Due to the exponential increase in the acid plant's maintenance costs, the profitability of Nitrogénművek will continuously decrease, its revenues will drop owing to the growing number of failures, the marketability of products will be adversely affected.
- The plant can only continue its operation if its major equipment is replaced in the long run. The related costs will be 70-80% of the costs of implementing a new acid production facility. However, the investments will not solve the problems of inefficient specific use of ammonia, too much low-pressure steam export and excessive natural gas consumption.

Alternative (2) cannot be the baseline for the following reasons:

- According to the decision of the owners of Nitrogénművek, the company wishes to continue its fertilizer production activity and endeavours to sustain its leading position in the domestic market. This can only be achieved through continuous acid production.

Alternative (3) is the most reasonable baseline:

- As the nitric acid plant, operating with a decreasing efficiency, high operating risks and growing maintenance costs, will have more and more problems in conforming to environmental regulations, the necessity of the construction of a new acid plant is inevitable.
- The market demand will make the new nitric acid plant investment profitable.
- No laws on N_2O emissions are in operation at present and they are not even expected to be passed in the foreseeable future, hence there is no economical reason to install an N_2O reducing catalyst.

Alternative (4) cannot be the baseline for the following reasons:

- The installation of the catalyst entails extra costs as compared to alternative (3), and it also involves a considerable technological risk.
- No laws oblige the company to curb its N_2O emissions, therefore, the construction of the catalyst is only a voluntary investment.

The following table shows the expected N_2O emissions of the baseline (alternative 3):

Table 6: Baseline emissions

					New acid plant	FIRST TRADING PERIOD				
Baseline: establishment of a new acid plant without a catalyst		**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Capacity	t/day	1400	1400	1400	1500	1500	1500	1500	1500	1500
Annual acid quantity	t/year	376,523	381,210	375,248	425,265	471,239	487,900	477,507	489,861	491,545
Annual operating time	day	269	272	268	284	314	325	318	327	328
Quantity of acid produced (planned)	t/h	58.33	58.33	58.3	62.5	62.5	62.5	62.5	62.5	62.5
Quantity of tail gas per one ton of acid	Nm3/t	4800	4800	4800	3200	3200	3200	3200	3200	3200
Quantity of tail gas	thNm3/year	1,807,312	1,829,808	1,801,190	1,360,848	1,507,965	1,561,281	1,528,024	1,567,554	1,572,944
N2O quantity in tail gas (planned)	ppmv	1370	1370	1370	1000	1000	1000	1000	1000	1000
N2O quantity in tail gas	tf%	0.137	0.137	0.137	0.10	0.10	0.10	0.10	0.10	0.10
Annual N2O flow, volume	thNm3	2476.0	2506.8	2467.6	1360.8	1508.0	1561.3	1528.0	1567.6	1572.9
Annual N2O amount	tN2O/year	4861	4922	4845	2672	2961	3065	3000	3078	3088
N2O emission factor	CO2e	296	296	296	296	296	296	296	296	296
Annual CO2e emission	**tCO2e/year**	**1,438,985**	**1,456,897**	**1,434,111**	**790,883**	**876,383**	**907,368**	**888,040**	**911,014**	**914,146**

3.2 Project line

The following table summarises the estimated N_2O emissions expected during the operation of the new acid plant established as a greenfield investment and equipped with a N_2O catalyst:

Table 7: Project line N_2O emissions

					New acid plant	FIRST TRADING PERIOD				
Project line: establishment of a new acid plant with a catalyst		**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Capacity	t/day	1400	1400	1400	1500	1500	1500	1500	1500	1500
Annual acid quantity (planned)	t/year	376,523	381,210	375,248	425,265	471,239	487,900	477,507	489,861	491,545
Annual operating time	day	269	272	268	284	314	325	318	327	328
Quantity of acid produced	t/h	58.33	58.33	58.3	62.5	62.5	62.5	62.5	62.5	62.5
Quantity of tail gas per one ton of acid	Nm3/t	4800	4800	4800	3200	3200	3200	3200	3200	3200
Quantity of tail gas	thNm3/year	1,807,312	1,829,808	1,801,190	1,360,848	1,507,965	1,561,281	1,528,024	1,567,554	1,572,944
N2O quantity in tail gas (planned)*	ppmv	1370	1370	1370	150	150	150	150	150	150
N2O quantity in tail gas	tf%	0.137	0.137	0.137	0.015	0.015	0.015	0.015	0.015	0.015
Annual N2O flow, volume	thNm3	2476.0	2506.8	2467.6	204.1	226.2	234.2	229.2	235.1	235.9
Annual N2O amount	tN2O/year	4861	4922	4845	401	444	460	450	462	463
N2O emission factor	CO2e	296	296	296	296	296	296	296	296	296
Annual CO2e emission	**tCO2e/year**	**1,438,985**	**1,456,897**	**1,434,111**	**118,632**	**131,457**	**136,105**	**133,206**	**136,652**	**137,122**

*Figures guaranteed by the technical supplier (reference plants: Linz, Ausztria)

In case of an increased market demand, the emissions planned for the period of 2008-2012 would also show a growing trend.

Note:

(1) The calculations of the capacity and the N_2O content of tail gas achieved with the installation of the catalyst were prepared on the basis of the guaranteed values provided by the supplier.

(2) The expected market growth can be estimated based on the market environment described in Section 2.4.7.

3.3 Emissions reduction

The following table summarises the estimated N_2O emission reductions, calculated in CO_2e, arising from the emissions of the project line and the baseline during the first trading period.

Table 8: Emissions reduction estimated in the first trading period

					New acid plant	FIRST TRADING PERIOD				
Emissions reduction		**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Project line	tN2O/year	4861	4922	4845	401	444	460	450	462	463
Baseline	tN2O/year	4861	4922	4845	2672	2961	3065	3000	3078	3088
Emissions reduction	tN2O/year	0	0	0	2271	2517	2606	2550	2616	2625
Total emissions reduction 2008 - 2012	**tN2O**	**12,914**								

					New acid plant	FIRST TRADING PERIOD				
Emissions reduction		**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Project line	tCO2e/year	1,438,985	1,456,897	1,434,111	118,632	131,457	136,105	133,206	136,652	137,122
Baseline	tCO2e/year	1,438,985	1,456,897	1,434,111	790,883	876,383	907,368	888,040	911,014	914,146
Emissions reduction	tCO2e/year	0	0	0	672,250	744,926	771,263	754,834	774,362	777,024
Total emissions reduction 2008 - 2012	**tCO2e**	**3,822,409**								

The amount of emissions reduction during the period of 2008-2012 is approximately **12,900 tons of N_2O**, which equals to **3,800,000 tons of CO_2e.**

4. MONITORING CONSEPT

Monitoring of the Project emission

N_2O meter placed after the catalyst will measure the Project emission continually. Determination of CO_2 equivalent from N_2O will be based on the international specific emission value, unless Hungarian specific one will not be available.

Nitrogénművek qualified under the 9001 Quality Management System (QMS) in 1997 and under the 14001 Environmental Management System (EMS) in 2000. All of the company's core processes are addressed by the systems, e.g., design, construction, maintenance, operations, etc. The systems describe the organisational structure, responsibilities, practices, process and resources for developing, implementing, maintaining, reviewing and monitoring the system. Both of them will be updated to include all Joint Implementation related monitoring and reporting procedures, including procedures in case of missing data.

The scope of data collection, its frequency and the related responsibilities

The N_2O emission's measurement will happen continually. One person will be responsible for the collection and registration of data used for measuring the project's performance. The project emission will be calculated on the bases of daily average data. The data will be archived both electronically (as Excel files) and by hard copies and shall be stored until 2015.

Monitoring control

Monitoring sheets will be verified by third party regularly.

5. ENVIRONMENTAL EFFECTS

As we mentioned in Chapter 2.8 according to the Government Decree No. 20/2001 (II.14) the implementation of the new acid plant including the N_2O emission reduction catalyst Environmental Impact Assessment (EIA) permit is not required. Therefore its requirements don't apply to the activity.

The activity created through the implementation of the Project will not have any effect on the present condition of the soil/ground water and the surface waters, while it will have a positive effect on the quality of air by the reduction of N_2O to 10-15% of the original value; whereas doesn't effect that gases which emission regulated by the Joint Decree No. 14/2001. (V.9.) KöM-EüM-FVM.

A part of the revenues arising from GHG emissions reduction will serve the purposes of achieving environmental targets, which can be regarded as a significant environmental effect.

6. STAKHOLSERS COMMUNICATION PROCESS

The permitting process of the new acid plant will include the authorisation of the N_2O catalyst, therefore, Nitrogénművek will manage the communication process these two investments together.

Although the investments are not required Environmental Impact Assessment therefore the communication doesn't have to be carried out according to the Government Decree No. 20/2001 (II.14), even so the Company plans to inform the key stakeholders in the following ways:

- Local newspaper
- Company website
- Company newsletter

During the communication process the information also has to expand to the construction phase of the implementation. Although this activity is periodic, but occurs higher noise and emissions because of the traffic increase, which might sting the population to the quick.

Moreover, the second run of the qualification of the Joint Implementation the company will organize dialog with all key stakeholders, including regional non-governmental organizations (Energy Club, Air Work Association, WWF), local governments and the general public, whose activity might be affected by or in some way connected to the implementation of the project.

