



S9.71 - Study into drying processes for animal feed materials and HACCP

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Welcome

GMP+ International provides the GMP+ Community with support, guidance and (background) information on the GMP+ FC scheme 2020 by means of our so-called "Support documents". These documents contain explanations and give examples of how the requirements can be implemented.

Different kind of supporting materials have been developed and include various tools, ranging from Frequently Asked Questions (FAQ) lists to webinars and events.

A special type of support documents are the reports of several studies, created by technical institutes, universities or research institutes. When considered still valuable, these documents are offered to the GMP+ Community as part of the Support Documents of the GMP+ FC 2020 scheme.



1. Preface

One of the actions ensuing from the Plan of Action Reinforcement quality assurance animal feed sector 1999 was preparing an insight into the risks of drying processes regarding direct drying. In particular the dioxin contamination found in Brazilian citrus pulp, as well as the subsequent dioxin contamination found in German bread flour were caused by the drying process. In addition to the fuels used, the settings of the drying installation play an important role.

It took extensive efforts to successfully complete the required inventory and risk assessment. Finally, the study was successfully completed by CCL Research in Veghel. The results have been included in this publication. This concerns a unique quantity of information, as data have not been collected on a similar scale before. However, all desired knowledge is not yet available and supplementary research is required for validation purposes.

This report contains the results of a survey into the hazards and risks involved in drying feed additives (animal feed materials) involving direct contact with hot incineration gases, in some cases mixed with tertiary drying air.

This survey was intended to result in an insight into the scope and nature of this risk in order to determine effective control measures. In addition to a report, a HACCP calculation model for 'direct drying' of animal feed materials has resulted from the project.

This calculation model seems a practical and straightforward tool to conduct a systematic preliminary analysis of direct drying in a wide range of situations that may occur. Validation of the model was possible only on a limited scale due to a lack of suitable data sets. The validations conducted provided a realistic risk assessment for these situations. However, the underlying data set is not, as yet, sufficient as a basis of reliable risk assessments for the full diversity of animal feed material used. Further development of this model is recommended. Conclusions based on analysis using this calculation model are always inferior to a full HACCP analysis conducted by an expert auditor.

In spite of these limitations, this provides a useful tool that can be applied in practical situations for further optimization of risk assessment in animal feed production.

Throughout this document, a number of documents, called appendices, have been used as reference for the study. Due to confidentiality reasons, these appendices are not published. They could be available under request.



Project report – Phase 1 + 2 + calculation model
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Study into drying processes for animal feed materials and HACCP

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Project name : **Study into drying processes for animal feed ingredients
and HACCP**

Phase 1 : Assessment and evaluation of the risks of "direct drying".

Phase 2 : Evaluation of specific risks related to feeding stuffs.

With calculation model: Risk evaluation



2. Summary and conclusions

This report contains the results of a study into the hazards and risks of drying feeding stuffs (animal feed ingredients) involving direct contact with hot incineration gases, in some cases with tertiary drying air. This so-called "direct drying" is now only applied on a limited basis for drying food for human consumption, but is still used frequently for drying animal feeding stuffs (animal feed ingredients). This drying technique is applied in The Netherlands and in other European countries. But also especially in non-European countries, where feeding stuffs are produced and processed, which are offered and applied in animal feed in The Netherlands.

Drying feeding stuffs by means of "direct drying" has been considered a critical process step from the point of view of food safety in the "Plan of action Reinforcement quality assurance animal feed sector" of the Product Board Animal Feed (1999). Since 1999 research has been done by order of the Product Board Animal Feed (PDV) with the intention of providing insight into the nature and extent of this risk insofar as effective control measures can be determined.

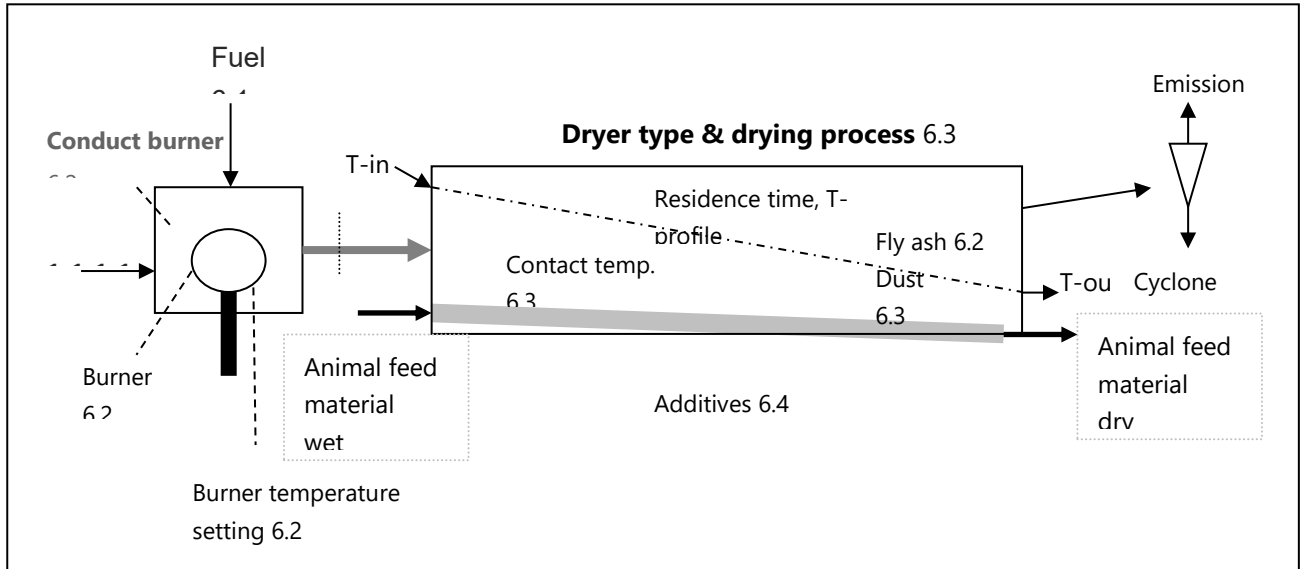
The purpose of the present survey, done by CCL Research in Veghel, on request of the Product Board Animal Feed, is to provide a complete assessment and advice. This assessment and advice will be formulated on the basis of information gathered already in previous projects, supplemented with additional information gathered within this project.

The project is executed in two phases, in accordance with the agreement with PDV. Phase 1 was aimed at a generic inventory, assessment and evaluation of the hazards and risks of "direct drying processes" (Horizontal risk assessment).

On the basis of the results, a calculation model has been drawn up for risk assessment in specific situations.

The insights acquired in phase 1 have been applied in phase 2 in order to assess the risks of "direct drying" more specifically for different flows of feeding stuffs. With this, a contribution is made to the quantification of "vertical risk assessment" of feeding stuffs which undergo drying processes.

The research in phase 1 started with an inventory of relevant information sources and actual and background information, which was considered necessary for realizing the project aim (chapter 4.1). With this, it was again established that insufficient and only fragmentary information could be acquired through the usual sources regarding the execution and risk assessment of drying processes for feeding stuffs. Subsequently, we had to use information from other sectors (energy, waste and environment) and of personal communications of experts. Various assumptions had to be made during the research, not all of which could be verified. The acquired information is arranged by means of a diagram of the "direct drying process" (see chapter 6.2.6).



In phase 1 of this study we have tried to identify the most important “Risk Drivers” and to assess these as quantitatively as possible. We have identified the following “Risk Drivers” as being the most important of the drying process:

- fuel;
- burner type;
- burning conditions;
- temperature profile in the dryer.

Furthermore, various factors have been identified, which have an effect on the level of risk and the possibility to be able to assess this carefully enough.

The addition and mixing of feed stuffs and dust fractions can result in a (serious) additional risk.

The HACCP system assigns numeric values 1 to 4 to risks and links control measures to these values. In order to be able to assess the risks of “direct drying” well, given the multifactorial nature of the drying process, an interactive calculation model has been drawn up in which risks can be quantified on a scale of 1 to 10,000 at first (chapter 8). However, in the end this assessment will be reduced to the common HACCP evaluation scale 1 to 4. The systematic identification and (obligatory) assignment of risk assessments to hazards also results in a cause-related de-termination of points of interest and control measures. The calculation model makes the risk assessment transparent, also for users who are not experts in drying processes.

The hazards and risks related to fuel are dealt with in chapter 6.1.

A conclusion of this study is that “direct drying” is very well possible (without un-acceptable risks) when “acceptable fuel” (natural gas, butane / propane and light fuel oil), mentioned in the PDV guideline “GMP and QC control measures regarding products to be dried and drying installations”, is used. Direct drying is also possible when various clean and checked gaseous and solid bio fuels and good quality coal are used.



However, only under the conditions that these fuels are "dry" and uncontaminated and that the burning process is arranged adequately, executed in the correct way and checked systematically.

The use of waste products (liquid [e.g. used organic solvents, waste oil] and solid [e.g. plastic, scrap wood]) as fuel almost certainly leads to serious contamination of the feeding stuffs and therefore results in an unacceptable risk.

The risks related to the burning process itself (the air heater) are dealt with in chapter 6.2 (burner types and conduct of burner).

It is tentatively concluded that the choice of the burner type (adapted to the fuel), but especially the operation of the burner / air heater determine the development of unwanted material, such as PAHs, dioxins, NO_x.

It cannot be assumed that burning processes in the burners / air heaters of dryers sufficiently disintegrate harmful substances in fuels (such as PAHs, DMNA (di-methylnitrosamine), PCBs, PBBs, dioxins and other organochlorine compounds). Therefore, the burning process does not eliminate the risk of fuel contaminated with these substances. The formation of NO_x from air nitrogen in case of high temperatures, which occurs in case of "optimal burning" by the way, is a special point of interest.

The risks related to the temperature course in the dryer and the contact with the product to be dried are dealt with in chapter 6.3. The risks concern a) the "de novo" synthesis (neoformation) of dioxins, condensation and deposition of contaminated substances such as metal and PAHs, b) the reaction of the product to be dried with the reactive components in the drying gas (NO_x, SO_x) and c) unwanted chemical decomposition of the product to be dried, which can cause the formation of unwanted substances.

The general conclusion of this study is that temperature courses in dryers can be sufficiently controlled in principle. Control measures for this should be determined per situation.

Risks related to the addition of additives, drying aids and dust-fractions of dried material are dealt with in chapter 6.4. In our opinion, additives should meet the product standards for feeding stuffs as determined in GMP-14. A few calamities in the past have indicated that additives can be a serious risk. Therefore, these additives should always be mentioned in the product specification and in the vertical risk analysis of a feeding stuff. Microscopic analysis of feeding stuffs is a simple method for recognising and identifying additives, also at low levels, which cannot always be determined unequivocally with chemical analysis.

Dust fractions, which have been separated from the outlet gas flow of directly heated dryers, may be transported back into the dried product. Given the chance that especially these dust fractions contain high amounts of unwanted substances, this transportation is advised against, unless it is checked that this dust fraction meets the product standards that apply to the product in question.



In phase 2 of this study the risks of some product-specific drying processes have been further investigated and mapped. The risk model developed in Phase 1 is used for this purpose. In Phase 2 we have also tried to acquire information about drying processes as these are practised outside of Western Europe and North America. Especially of drying processes in small-scale arrangements, which are executed outside of the direct range of influence and control of certified producers and traders of feeding stuffs.

In order to acquire this information, interviews have taken place with experts who could give a description from their own experience of these processes and of the hazards and risks related to it. The results of Phase 2 are dealt with in chapter 7. The acquired information is relevant, but certainly not complete.

It is not possible, and it has not appeared to be meaningful either to make complete risk assessments for all drying processes which are found or can be found in the production sequences of all feeding stuffs (animal feed material).

The reality is too diverse for this and too much determined by local situations, which are, in time, also subject to change. A judgement about that in this report could wrongfully lead to imputations or to phantom securities.

The definitive risk assessment of a product-specific drying process will ultimately have to be delivered to the buyer by the supplier of the feeding stuff in question (GMP 26a and 26b). The generic vertical risk analyses per product or product group are useful guidelines regarding this, although not all drying processes are adequately described in these. The calculation model developed in this study seems to be an excellent tool in analysing and (semi-)quantitatively evaluating the risks of specific drying processes. The calculation model can be further refined in the future.

The conclusions and recommendations of this study are mentioned step by step in chapter 10 of this report. Phase 2 did not result in significant adjustment of the temporary conclusions which were drawn after finishing Phase 1.

In Phase 2 it was not proven that arranging feeding stuffs into groups related to the origin or chemical composition results in substantial additional information about the risks to be expected.

The final conclusion of this study is that drying processes involving "direct drying" can be executed without unacceptable risks for animal feed production in The Netherlands and for the food chain, provided that a number of well-defined conditions are met. These conditions regard the "Risk Drivers" identified in this study and the application of a GMP-HACCP system to the drying processes and the flow of material that are related to those (fuels, additives, product logistics). If sufficient information about drying processes in a production sequence of feedingstuffs is lacking, the highest risk score "4" should automatically be assigned (according to the HACCP system).



This means rejection of the feed additive in question, unless the safety of the feed additive in question can be sufficiently guaranteed by taking additional control measures.

In our opinion, the differentiation can be made that inadequate information about combining product flows in the “collectors” course in countries of origin can be accepted, provided that there are no indications that systematically risky methods are being used.



3. Introduction and social framework

3.1. Introduction

The study into the risks of drying processes for the safety of animal feeding stuffs, which is described in this report, has been done for the Product Board Animal Feed (PDV). It is a continuation of a number of previous studies dealing with the same issue, which have been initiated by the Product Board Animal Feed (PDV) since 1999. This study should lead to complementing previous initiatives to reach a model for risk assessment for drying processes, applied in the production column of animal feeding stuffs to a system for specific control measures for these processes, which are directly applicable in HACCP models for animal feeding stuffs (GMP 26a, 26b i).

The basis of this study can be traced back to June 1999. At that time the Product Board Animal Feed (PDV) started a "Plan of action reinforcement of quality assurance animal feed sector". Causes for this were, among others, a number of serious calamities in this area. Already in 1999 this systematic action resulted in the GMP regulation for the animal feed sector. In 2000 this was supplemented with an HACCP model for the animal feed sector, which was integrated with the GMP model, which resulted in the present GMP+ model (Product Board Animal Feed, 2000).

In the "Plan of Action" four problem areas were identified, which needed further investigation urgently, since these could possibly lead to serious risks for consumers of food of animal origin. One of these four risks was described as follows: "Contamination of materials during drying in direct contact with incineration gases".

In November 1999, a study was reported by a project group of RIKILT-DLO (State Institute for Quality Control of Agricultural Products), in accordance with the Product Board of animal Feed and the study group RIGRO, and in cooperation with TNO-Food (RIKILT-DLO, 1999). This "RIGRO study" assumed a so-called "horizontal risk analysis" of the animal feed chain, which outlines the four previously observed risks, connected with separated process steps in the chain. The specific circumstances and risks related to the specific product flows have not yet been examined with regard to this (the so-called "vertical risk analysis").

In chapter 6 of the "RIGRO report" the possible hazards related to drying in direct contact with incineration gases are identified and described in short. It is established that within the EU drying of food with "directly heated dryers" hardly occurs any-more. The most important reason for this, in our opinion, is the attempt to minimise the possible formation of carcinogenic nitrosamines (N-nitrosomethylamine, especially DMNA) in food for humans. There is no sufficient insight in the extent to which "directly heated dryers" are applied for animal feed within and also outside of the EU. Although the hazards of contamination of the product with DMNA (DNMA, DMN), PAHs, dioxin, PCBs, PBBs are pointed out, the actual risks for the food chain cannot be assessed sufficiently yet and there is not enough information available in order to establish adequate control measures.



On the basis of the RIKILT-DLO study and by the order of the RIGRO working group ("Risk Inventory of Materials), an ad hoc "sub working group drying", led by TNO-MEP (Project manager and secretary Eng. J. Boot), has tried to provide further insight into the observed risks of "direct drying" and to establish actual control measures to be taken (TNO-MEP, 2000) In their report (project number 30786 of January 11th 2000) the working group describes the nature and origin of the flows of material for animal feed, a number of drying technologies used for this and the fuels which are used most with regard to this.

The working group comes to a number of conclusions with regard to (groups of) flows of materials, fuels, and burner and dryer installations. The working group also comes to the conclusion that insufficient concrete information is available in order to come to specific control measures, as contemplated, but makes the following five recommendations on the basis of their study to be able to come to concrete and adequate control measures in a future project:

1. inventory of risk-bearing fuels and materials in potentially critical countries of origin.
2. To include possible control measures in the GMP code for animal feed.
3. Purchase policy of fuels should be included into the GMP code for the purchase of fuels.
4. Purchase policy of animal feed materials fuels should be included into the GMP-code for the purchase of animal feed materials.
5. Via the purchase policy, a monitoring programme should be introduced for the purchased materials and fuels.

According to this working group, control measures should be taken in this follow-up study with regard to fuels, burning and drying processes, generic as well as per product group and in connection with the (countries of) origin of the animal feed materials in question.

Moreover, it is argued that these measures be included in the GMP-code and HACCP procedures.

Mid 2000 the steering committee "Plan of Action" of PDV concludes that no sufficient concrete control measures are formulated in the report of the RIGRO / TNO-MEP working group, in order to be able to face the problems which can occur in direct drying of feeding stuffs. Mr. Eng A.J. Rottier of the Consultants & Engineers office TEBODIN is prepared to lead a "restart project" of this ad hoc Working group Drying.

The members of this working group were expert representatives of important sections in the production and supply of feeding stuffs.

The new working group started their activities in September 2000, made an inventory of the results of previous studies, at home and abroad, defined their mission, formulated a detailed project description and a plan of work, as well as a detailed concept Questionnaire Control Measures Drying Animal Feed Products" (and possibly Food).

The working group started formulating a "Matrix for The Netherlands" and a "Matrix for abroad" of feeding stuffs which are (probably) dried through "direct drying".

Unfortunately, this working group was not able to finish the project plan they had drawn up.



In the meantime, the Product Board Animal Feed had made considerable progress in formulating the so-called "Vertical risk assessments" according to the HACCP system for about 70 feeding stuffs classified into main groups according to the Eu-ropean classification of materials (96/25/EG). In a large part of these vertical risk assessments, the process step "drying" occurs once or more often (Product Board Animal Feed, GMP 26b i). The basis of the risk assessments which have been used with this and the basis of the control measures mentioned with regard to this were in fact still insufficient.

The Product Board Animal Feed made preparations in 2002 and 2003 in order to further implement the vertical risk assessment regarding the GMP regulation animal feed sector, by means of establishing a "Database Risk assessment feed material" (DRV), in which generic risk assessments should be filed per product, formulated by the producers and suppliers of feeding stuffs and additives. For these risk as-sessments according to the HACCP system it is also necessary to be able to assess the risks of the drying processes therein correctly and to indicate the effective con-trol measures for the different drying processes.

Therefore, the Office Quality Policy (BKB) of the Product Board Animal Feed took the initiative, in 2003, to complete the "horizontal risk analysis" of drying processes in the production and supply of feeding stuffs by means of a concluding study in which the results of the previous studies should also be incorporated.

At the request of the Product Board Animal Feed, CCL BV made a proposal, in April 2003, for such a concluding study, with the title "Study into drying processes for animal feed materials and HACCP". In July 2003 the order was given to CCL BV and the AVO working group Food & Quality (V&K) was appointed for leading this study on behalf of the PDV.

The approach, the development and the results of this study are dealt with in this report.

3.2. Social framework

The great interest for the safety of animal feeding stuffs, additives and animal feed is related to the great public interest in food safety in general and the safety of food of animal origin in particular. The outlines for the policy within the EU have been established in the document "White paper on food safety" (Commission of the European Community, 2000), in which an independent European Food Authority is presented with great authority in this area, supported and founded by scientific ad-vice with regard to content. Food safety should be based on the knowledge of potentially harmful substances and the (biological) effects and knowledge of the origin and/or formation in the chain of production and supply of food.

In the chain of production of food with animal origin, food safety is also mainly concentrated on contamination with harmful substances, of a chemical, physical or (micro) biological nature. (European Commission, 2000. Opinion of the Scientific Committee on Animal Nutrition.)



The report "Food for thought: Safety risks in animal feed chains" (Research for policy, Q-point, 2003) drawn up by the order of the House of Representatives of the States of the Netherlands has been published recently. The complexity of the animal feed chain, the volumes and the global business flows relevant to The Netherlands; the general risks which can be involved in contamination of different materials and the functioning of the control system are described in this report. In this report, no attempt has been made to quantitatively describe the risks on the basis of existing data. It contains extremely relevant background information for this study into the risks of drying processes in the production of feeding stuffs.

The animal feed sector feels it is its own responsibility to take initiatives with regard to this. The different activities and measures which arise from the "Plan of action reinforcement quality assurance animal feed sector" 1999 of the PDV are the realization of this.



4. Aim of this study

The aim of this study is giving a systematic risk assessment and resulting proposals for control measures for drying animal feed materials with directly heated dryers. The risks related to contamination of dried products with toxic substances as a direct result of the applied drying process. The products regard animal feed materials (feeding stuffs) which can be applied in The Netherlands.

The results of this study are intended for all parties which are responsible for the quality control in the entire chain of production, supply, purchase and processing of feeding stuffs, which means: parties which execute drying processes, parties which trade dried feeding stuffs and parties which purchase these for application as feed stuff. Indeed also for policy formulating and regulatory bodies which are responsible for the animal feed sector.



5. Focal point and definition of the project

The project plan with expected results and the definition of it is described in detail in the project proposal (CCL 335.03.P.01), which was offered to the PDV on May 16th 2003 (Appendix 10).

In accordance with the recommendations of the RIGRO working group the issue of contamination of feeding stuffs by drying processes has been divided into two complementary areas of interest, and also project phases in this project, which are:

1. Assessment and evaluation of the generic risks of drying processes which are determined by fuels, burning processes and drying processes (project phase 1).
2. Assessment and evaluation of the risks of "direct drying", which are specific to certain product groups, which are determined, among other things, by the nature of the feed additive, the interactions between the drying conditions and feed additive, and the (technological & geographical) environment where the drying process takes place (project phase 2).

The project is defined as follows (in accordance with the plan):

- The central issue is direct drying using incineration gases. Indirect drying, in which case the product does not come in contact with incineration gases, is much less risky and is not included within the boundaries of this project. Sun drying has its own specific risks (among other things micro organisms and mycotoxins) but is not included in this project either. Sun drying (drying with direct sunlight) is mainly applied to drying freshly gathered products in order to keep the product well and to make it transportable. The drying process can take a few days and can only be controlled to a limited extent (Cornelius 1973). The possible risks of drying with air that is not heated, whether with mechanical ventilation (air drying) or not, is not examined in detail in this project either. The risks can be partly compared to those of sun drying; additional is the risk of contamination by elements in ventilation air.
- Risks to be evaluated are the presence of specific harmful substances in the dried product, as far as these can be connected with executed drying process-es. The risks are being assessed on the basis of accepted standards for maxi-mum acceptable levels (action limit, rejection limit).
- Contaminations by means of the transfer from flue gases or deposit from fly ash, and which are formed in the product as a result of the drying process are discussed. Contamination that was already present before the drying process (with the same contaminating substances) can be a risk, but this is part of a different risk evaluation. Contamination as a result of the addition of additives to the feed stuffs to be dried (as part of the drying process) is considered part of this project.



- The transfer of harmful material to the product to be dried as a result of the drying process is being examined. Not the emission of harmful material to the environment as a result of the drying processes (although much information is available on that subject).
- Harmful materials that are evaluated in this project are the already identified risk-bearing contaminants which can be present in incineration gases: PCBs, PBBs, Dioxins, PAHs, SO_x, fluorine, heavy metals (especially cadmium, lead, mercury and arsenic). Moreover, NO_x, as a factor in the production of nitrosamines (among others) and conversions in the product to be dried as a result of over heating (caramel, Maillard products, LAL) also play a part. Through public MER data for flue gas emissions any other contaminating substances, originating from burning processes, can be identified (e.g. radioactivity in flue gases).
- The HACCP Manual Animal Feed Sector, April 2003, has been used as the basis for the risk assessment. The limit values for harmful substances published by PDV as part of GMP have been adopted as such in this study (PDV Product standards GMP - GMP-14; 09-22-2003). The standards mentioned are considered a given in the risk analysis in this report.
- In the specific risk assessment per type of feed stuff (project phase 2) only products are inspected which have (possibly) undergone one or more direct drying steps and which are offered, used, or which can be used as feed stuff (animal feed material) in The Netherlands. Feeding stuffs which are produced in The Netherlands, but are only used for export are also part of this study. The starting point for this product specific assessment in project phase 2 is the so-called "vertical risk assessments assessment" of about 70 dry materials which the PDV has available by now (Publications PDV 2000-2003, GMP 26a and 26b i, DRV iii).

The activity "Drawing up HACCP model" concerned formulating a theoretical data work model in which information gathered during the project could be classified and evaluated, as well as formulating the in the project plan proposed operational "Calculation model" for semi quantitative risk assessment and linking that to specific control measures.

This model is further described in Chapter 8 and is also part of the results of this study which are to be delivered to the client. This calculation model is available as Excel programme for a first systematic risk assessment of drying processes (Appendix 15).



6. Execution of the study – Phase 1

6.1. Study into data and relevant background knowledge

The following sources have been referred to:

Reports, scientific literature and digital information

- The reports of the previous studies by RIKILT, TNO-MEP and TEBODIN, the relevant regulations and directions of the Product Board Animal Feed, issued as part of the implementation of the "Plan of action reinforcement quality assurance animal feed sector" and general publications about this subject.
- International databases for scientific literature, on the basis of in advance formulated search profiles, and with the help of a documentalist of WUR, an expert in the field of harmful substances and toxicology. For the toxin classes [dioxins, PAHs, heavy metals, Pb, Hg] we have searched with the search terms [drying/ combustion,] combined with [contamination, animal feed, feed stuffs]. Furthermore, the toxin classes have also been combined with [grains, cereal, barley, wheat, copra]. With these search terms we have searched in TOXLINE, Zoological Record, FSTA, ISI-Current Contents, MEDLINE and SciFinder Scholar.
- Internet: Additional information has been acquired through searches by means of all relevant headwords with, among others, the international search engines "Google" and "Altavista".

Research centres

Research centres have been consulted with the purpose of acquiring specialist information concerning the project aspects which belong to their specific field of knowledge. In some cases a specific "consultancy assignment" has been given in order to have the correct desired information gathered and offer structured information for the benefit of this study.

Consultancy assignments (on payment from the project budget) have been given to:

- KEMA, for the field of fuels, burning processes, efficiency and emissions, especially of burning processes for the (large-scale) generation of electricity. We have also spoken with Mr. B.H. te Winkel and Mrs. S. Stokman. The application of fossil and bio fuels and formation and emission of dioxins, PAHs and NO_x under a number of conditions have been discussed. KEMA has also supplied data: levels of heavy metals in fuels, the degree of capture of dioxins in case of flue gas purification. The output was a report (KEMA 2003) with these data. As a result of the discussion, the remaining questions have been answered in an additional report (KEMA 2003a). KEMA did not have any specific information on dryers (appendix 13).
- NIZO, for specific information on, for the study relevant, aspects of drying dairy products. We have spoken with Mr. eng. R. Verdurmen.



The conclusions of the conversation were mainly qualitative. These have been recorded in a report authorised by NIZO and have been incorporated as a “personal statement” (appendix 14).

- RIKILT, to test the set-up and the effect of the semi-quantitative risk model developed by CCL, and to test the assumptions made with regard to that model. During a meeting, the practical operation of the risk model was demonstrated to the researchers of the RIKILT (Mr. Dr. eng. J. van Klaveren, Mr. Dr. eng. L. Hoogenboom and Mrs. eng. M. Noordam); after that, the structure of this model and the now available data set of observed contaminations in directly dried feeding stuffs have been discussed with them (appendix 7).
- The conclusion was that there is very little public information on actually found levels, while this information is essential to be able to test the hypotheses made in the model. Therefore, RIKILT has delivered a set of relevant analysis results, for the benefit of this study, from the non-public database “National monitoring animal feed RVV/RIKILT” (appendix 7).
- TNO-MEP (Environment Energy and Process Innovation), Mr. J. Boot and Mr. eng. H.C. van Deventer, experts on drying processes at TNO-MEP and chairman of the “Dutch Working Group Drying”. This renowned working group of drying experts from research and business has a good overview of all internationally available information with regard to drying processes. We refer to the internet site of the NWGD (Dutch Working Group Drying), in collaboration with NOVEM (Netherlands Agency for Energy and the Environment). This contact has only resulted in general background information on drying processes (see: <http://www.drogen.nl>).
- RIVM/CRS / Chemical Substances Bureau. Only referring to website <http://arch.rivm.nl> and to the Ministry of Housing, Spatial Planning and the Environment, Directorate Materials, Waste products, Radiation.
- Ministry of Housing Spatial Planning and the Environment, Environment DG, Direct Dusts, Waste Products, Radiation. Advice by telephone by Mr. K. den Herder concerning the standards for fuels and burning waste. We have referred to the regulations with regard to the National Waste Management Plan (LAP) 2002-2006 and accompanying sector plans and the decree BOH-13 concerning Organic Halogen in Fuels. We have also referred to the highly comprehensive website of the ministry <http://www.vrom.nl>

Companies and laboratories

Private companies and laboratories are concerned here, which are active in drying, purchasing, trading and/or analysing feeding stuffs. The information gathered has partly been acquired from discussions with qualified contact persons by means of in advance formulated questionnaires, and partly in the form of information sent at request, such as analysis data of directly dried products.



The provided information is still confidential at this moment and can therefore not be added to this report

Relevant information was acquired from the following companies/sectors:

Maasweide Laboratory Services (Nutreco), especially concerning contamination of dried feeding stuffs by polluted additives, which are used as drying aids. Maasweide has, among others, specific expertise (microscopic techniques, image processing and reference preparations) for demonstrating and identifying additions to feeding stuffs on a level of a few percent. This discussion was held with Mr. eng. A. Swinkels and J. Zegers.

- Cehave-Landbouw Belang, Quality Control: general information on the purchase of dried feeding stuffs and the procedures for producer auditing and QC of sets of feeding stuffs to be purchased. Talked to Mr. eng. C. Gloudemans. Information concerning specifications of pit coal which is used for direct drying of lucerne and grass. Provided by suppliers as part of GMP+.
- Robi Droge Diervoeders B.V. and P.C. van Tuijl Kesteren BV.; written information, sent by Mr. Eng. A. Gotink on his own initiative, regarding his own study of levels of dioxins and PAHs in drying bread. Levels before and after the drying process were compared. From these levels appeared that no demonstrable deposition of PAHs and dioxins occurred. The examined samples amply met the applicable quality requirements for dioxins (0.75 ng WHO-TEQ/kg product) and PAHs (1 µg/kg BaP/kg product) in animal feed.
- IRS-dep. Animal feed. Written information regarding dioxins/PCB in treacle and dried beet pulp (in pellet-form) measured externally by the order of a number of beet pulp producers, led by the IRS, during the campaigns of 2001, 2002 and 2003. Information sent by Mrs. Eng. M. Kaemmerer van Os. The dioxin levels which were found in this study are very low and amply below the EU standards (0.75 ng WHO-TEQ/kg product and 12% humidity), as well as the accepted action limits (0.5 ng WHO-TEQ/kg product and 12% humidity). PCB levels are also extremely low. The report will be published by IRS in due time.
- ADM Europort: Question with regard to drying soy by-products among other things. In a telephone conversation with Mr. J. Spek it became clear that ADM switches over, and/or has already switched over, from direct drying with gas-heated installations to drying by means of indirect heating.
- NVG-Nederlandse Vereniging van Groenvoerdrogers (Netherlands Organisation for Greenstuff Drying): in some telephone conversations with Mr. eng. J. Leutscher, advisor VNG, we have discussed which critical issues are present with regard to direct drying of grass and air (and among other things processed to flour and pellet) with pit coal for fuel. The QC/QA measures and control measures applied by NVG members have then been summarised in writing and sent. NVG members work according to a detailed quality manual.



The coals used are from a known origin and specification, in which case transport and delivery are monitored; the drying process is set, followed and data are being recorded; as part of GMP, sample research is done, among others by RIKILT.

- The remark is made that dioxins and PAHs can be present in these products by contamination of the crops on the field. The increase as a result of the drying process can be disregarded. Information has been given on studies in Denmark, France and The Netherlands with comparable results.
- N.Z.O. Nederlandse Zuivel Organisatie (Netherlands dairy Organisation); Conversation by telephone with Mr. eng. P. Mathot. For an important part, an abstract and actualisation of his contribution in the RIGRO working group. Confirmation of the extremely well secured situation in the Dutch dairy industry, also with regard to products intended for animal feed, such as skimmed milk powder and whey powder products.

Attention was specifically asked for the risk of unintentional pollution of fuels (especially liquid) since HACCP has a very different character in the fuels sector than in the food and animal feed sector.

- Suiker Unie; Telephone conversation with Mr. eng. J. Dijkstra for information on the fuels used for drying sugar beet pulp, the implemented controls in the purchase of fuel and the arrival of it, and the type of dryers used. In The Netherlands, the sugar industry uses natural gas or light fuel oil, which is purchased on high specifications, related to the requirements for (direct) drying of beet pulp and the environmental requirements for the emissions of the pulp drying houses. The supplied sets are also analysed for specifications and pollution before use.
- NOVE; Nederlandse Organisatie Voor de energiebranche (Netherlands Organisation for the Energy Sector). Conversation by telephone with Mr. W. Schouten about specifications of liquid mineral fuels and maximum permitted levels of unwanted substances. All operations of the NOVE members are ISO 9002 certified. We have been provided with useful oral and written information with reference to the NOVE website: www.nove.nl
- Shell Nederland Verkoopmaatschappij bv, Capelle a.d. IJssel; Request for information on PCB in fuels. The sole statement that these are absent within the set standards. No concrete statement of levels.
- The PDV-AVO working group Food and Quality (V&K) has commented on the different concepts of this report orally and in writing in the mid-term reports of November, December, January and April.

At GMP+ International, we believe everybody, no matter who they are or where they live, should have access to safe food.

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