Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

Effects of Safety Management Systems in Seveso-Establishments

Review of the situation in Seveso-establishments in NRW, what changes have occurred due to the implementation and maintenance of Safety Management Systems in 2000

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Öko-Institut e.V.
Büro Darmstadt
Rheinstraße 95
D-64295 Darmstadt
Telefon +49 (0) 6151 - 8191 - 0
Fax +49 (0) 6151 - 8191 - 33

Geschäftsstelle Freiburg
Postfach 50 02 40
D-79028 Freiburg
Hausadresse
Merzhauser Straße 173
D-79100 Freiburg
Telefon +49 (0) 7 61 - 4 52 95-0
Fax +49 (0) 7 61 - 452 95-88

Büro Berlin
Novalisstraße 10
D-10115 Berlin
Telefon +49 (0) 30 – 40 50 85 - 0
Fax +49 (0) 30 - 40 50 85 - 388

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Safety Management Systems
in Seveso-Establishments

Author:

Dipl.-Ing. Stephan Kurth

Dipl.-Ing.'in Antje Benischke

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1 Introduction

The German Hazardous Incident Ordinance (Störfall-Verordnung, 12. BImSchV) amended in 2000 established the requirement on a Safety Management System in Seveso-establishments where the thresholds for hazardous substances are reached or exceeded. The Major Accident Prevention Policy and the Safety Management System (SMS) have to be described in the Safety Report by the operator and have to be updated if necessary. Fundamental requirements on the design of the SMS are given in appendix III of the German Hazardous Incident Ordinance.

The North Rhine-Westphalia State Agency for Nature, Environment and Consumer Protection has announced a project aimed to investigate the effects of SMS on plant safety. For this purpose changes in Seveso-establishments, which are in the context of the implementation of SMS according to appendix III of the German Hazardous Incident Ordinance as from 2000, shall be determined and evaluated.

The project covers mainly the following elements:

- determination of criteria for the review of the situation
- design of a questionnaire
- realisation of the questioning
- final report on the evaluation of the questioning

The final project report as here presented is structured as follows:

- key data of the project are given in chapter 2
- the proceeding used for the investigation is explained in chapter 3
- the unvalued results of the questioning are presented in chapter 4
- conclusions are drawn in chapter 5
- chapter 6 contains a summary of the report

2 Project Schedule

The project dealing with the effects of SMS in Seveso-establishments was commissioned in September/October 2008.

The work program started with the determination of criteria characterising the SMS, which can be used as a basis for the design of a questionnaire regarding the determination of change processes. In November 2008 an interim report was issued, in which primarily the criteria for the review of the situation in Seveso-establishments were explained and a first draft version of the questionnaire was provided. A project meeting took place in December 2008.

In the final version of the questionnaire instructions for the fill-out of the form and a supplementary sheet written by the LANUV NRW were added, in which the proceeding and the objectives of the project were explained. It was forwarded to the Seveso-establishments in North Rhine-Westphalia by the end of March 2009. Simultaneously, the data files were provided for download in the internet presence of the LANUV NRW. Contact addresses for reply and for support were installed.

It was asked to have the questionnaire returned till Mai 2009. The time limit was extended when a further reply could be expected. From this a rescheduling of the timetable resulted. Even the questionnaires arriving behind schedule were considered. One questionnaire arrived by the end of June 2009 after the draft version of the report was issued. It was considered in the final revision of the report.

At the same time the answers arrived the collection and evaluation of the questionnaires started. First, the answers were collected according to standardised criteria and merged into synoptical tables. In the course of the evaluation the data were analysed and transformed into figures.

The interpretation and evaluation of the results is part of the project report. A final version of the report in German was issued in August 2009. Hereby, you will find the English version.

3 Proceeding

3.1 Determination of criteria for the review of the situation

The features characterising a SMS were determined as a base for the development of the questionnaire. Appendix III No. 3 of the German Hazardous Incident Ordinance holds specific requirements on the SMS. Guidelines of the German Accident Commission (SFK – Störfall-Kommission), guidance of authorities as well as expert reports describe additional recommendations for the implementation of the requirements and their verification. In particular cases publications and standards from related technologies were considered to comprehend basic principles and exemplary proceedings.

Below, requirements according to appendix III No. 3 of the German Hazardous Incident Ordinance and afterwards other characteristics arising from the analysed papers are composed.

The selection of the criteria which had to be considered in the questionnaire was based on the following reasons:

- Considering the essentials of SMS.
- Reference to SMS in Seveso-establishments according to the German Hazardous Incident Ordinance.
- Determination of safety related changes due to the implementation of the SMS and reflecting the operational experience referring to this.

3.2 Design of the questionnaire

The questionnaire asks for aspects of changes briefly, which correlate with the implementation of the SMS in Seveso-establishments. At the top of the questionnaire is a section containing general information (e. g. industrial sector, size of the company, configuration of the management system). Subsequently, the questionnaire is structured according to appendix III No. 3 of the German Hazardous Incident Ordinance. The end of the questionnaire refers to other changes due to the implementation of the SMS but which are beyond the matter of plant safety.

Structure of the questionnaire:

0. General Information
1. Organisation and Personnel
2. Identification and Evaluation of Major Hazards
3. Operational Control
4. Safe Management of Changes

5. Planning for Emergencies
6. Monitoring of SMS Performance
7. Management Review
8. Other Changes

The design of the questioning considered the following criteria:

- The answering shall be possible by means of information that are already available or that can be obtained easily.
- Subject and scope of the questions shall be answerable by different recipients (organisational form, size of the company, industrial sector).
- The range of answers which can be expected shall be suitable for conclusions according to the project objectives.
- The answers that can be expected shall be determined and objectified in such a way as to enable an overall view for all respondents and to facilitate the evaluation at an appropriate effort.

The completion of the questionnaire required the entering of plant specific data as well as the marking of options as offered. About that, fields were provided for additional comments.

Attached, you will find the questionnaire.

3.3 Execution of the questioning

The questionnaire asking to reply was sent by the end of March 2009 to 496 companies holding Seveso-establishments in North Rhine-Westphalia. The participation in the questioning was not obligatory. 75 responses containing 63 completed questionnaires returned.

Support addresses were installed (e-mail, phone) accompanying the questioning. About 35 times it was made use of this service. The questions mostly affected the download and the return of the questionnaire file. In individual cases it was about objectives and background of the project as well as about single contents.

3.4 Final report on the evaluation of the questioning

At first, the answers were screened to be principally suitable for the evaluation as intended. The following exceptions were detected:

- A few questionnaires were filled in incompletely. Single questions were not answered. However, the overall evaluation of these questionnaires was not com-

promised. As far as a comprehensible context was given, particular supplements and corrections were added in the course of the evaluation. But this was not always practicable.

- In particular cases the SMS was implemented recently, the questions were answered incompletely, because a sufficient experience arising from the SMS is not yet available (“no entry”).
- One questionnaire was filled in for Seveso-establishments at two sites, the one is subject to the basic obligations and the other is subject to the extended obligations according to the German Hazardous Incident Ordinance. In parts specific data for each of the sites were entered, in other parts unspecific data for both sites were combined. This questionnaire could be considered only with restrictions.
- Two questionnaires could not be evaluated:
  - One questionnaire instead of specific information contained only a reference to the plant management by another company at the same site and the questionnaire as answered by this company.
  - One questionnaire was not filled in referring to the following reasons: The Seveso-establishment is subject to the basic obligations according to the German Hazardous Incident Ordinance. Hence a SMS is not required.

Normally, the results are described quantitatively by the percentage of Seveso-establishments which have answered in a certain manner. Mostly, multiple answers were possible. Thus a summation of percentages exceeding 100 % is possible. The evaluation differs if one option to answer is selected exclusively (percentage of Seveso-establishments: “exclusively”) or if it is selected as one among other answers (percentage of Seveso-establishments: “totally”).

By means of the distribution of the answers and by the combination of the data, conclusions based on plausibility checks were drawn regarding dimension and importance of the changes caused by the implementation of the SMS.

Under „additional explanations (questionnaires)“ excerpts from the questionnaires are listed related to the given context. The expressions are not reproduced completely but as a content covering extract. The additional explanations were examined how far they contribute to the concrete problem. Explanations are not continuously available but only for a part of answers, so they are not valuated quantitatively. A quantitative, statistical analysis checked against scientific criteria is not possible on the basis as given here and is not intended.

Under „other”, in parts expressions are entered only for explanation of different answers. Answers which have no independent meaning were not considered quantitatively.

The evaluation refers to the reply of the questioning as available.

4 Presentation of the results

4.0 General information

Question 0.1: General information on the Seveso-establishment

Response

- Industrial sector.

  A shortlist prepared by the LANUV NRW was provided for the answering. The following industrial sectors were mentioned:

  - chemical industry, pharmaceutical industry: 41 %
  - metal industry, iron and steal, galvanic industry: 21 %
  - shipping and storage: 8 %
  - energy industry: 7 %
  - waste management, waste disposal, waste recycling: 3 %
  - plastics processing: 3 %
  - liquid gas storage, tank farm: 3 %
  - waste combustion: 2 %
  - petroleum processing: 2 %
  - other: 7 %
  - no entry: 3 %

- The Seveso-establishment is according to §1(1) of the German Hazardous Incident Ordinance …
  - subject to the „basic obligations“: 29 %
  - in addition, subject to the „extended obligations“: 69 %
  - no entry: 2 %

  Specific dates as from the Seveso-establishments have been subject to the German Hazardous Incident Ordinance were indicated between 1975[1] and 2009.

- Size of the company, number of employees.

  The number of employees was asked regarding two reference dates:

  - As a first date was chosen a point prior to the amendment of the German Hazardous Incident Ordinance in the year 2000, namely the 31 December 1999.
  - The second date was chosen as a reference to the current situation, namely the 31 December 2008.

[1] The German Hazardous Incident Ordinance was established in the year 1980. Although answers referring to a date prior 1980 are considered here.

The number of employees in the Seveso-establishment was asked because the number of personnel may influence the structure of the management. The values were divided into four size-classes[2].

Table 4.0-1: Size of the companies

size of the company	number of emloyees	percentage of Seveso-establishments	
		31 Dec 1999	31. Dec 2008
„micro“	1 – 10	13 %	11 %
„minor“	11 – 50	23 %	21 %
„medium“	51 – 250	33 %	44 %
„major“	> 250	18 %	20 %

no entry: 13 % (31 Dec 1999) bzw. 3 % (31 Dec 2008)

Variations concerning the size of a company could be determined for Seveso-establishments which had indicated the number of employees for both reference dates:

- increasing number of employees: 51 %
- constant number of employees: 14 %
- decreasing number of employees: 35 %

The spread of fluctuation varies from - 45 % to + 270 %, related to the original size of the company. The average size of the companies increases by 8 % from 311 (31 December 1999) to 337 employees (31 December 2008).

Additional explanations (questionnaires):

erweitertes Warenspektrum; normales Wachstum; Umstrukturierung; Erweiterung; Auslagerung des Fuhrparks, Umzug

Question 0.2: General information on the Safety Management System (SMS).

At what time the SMS was implemented in your Seveso-establishment?

Response

- in 2000 or later: 70 %
- before 2000: 20 %
- no entry: 10 %

[2] according to the Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises (2003/361/EC)

Additional explanations (questionnaires):

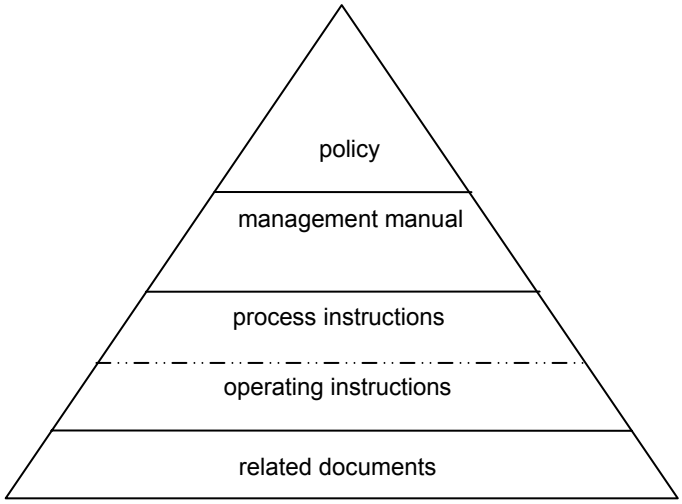
integral zu Beginn der 90er, im Bezug auf 12. BImSchV wurde SMS 2005 eingeführt; fortlaufender Prozess seit mehr als 10 Jahren; integral zu Beginn der 90er Jahre, ca. 1996 ISO.

Question 0.3: General information on the management system.

Please describe the configuration of the management system in your Seveso-establishment at the following dates

- 31 December 1999 (prior to the implementation of the SMS)
- 31 December 2008 (current situation)

Figure 4.0-1: Exemplary configuration of the management system



Response

The answers regarding the management system overall are summarised in table 4.02. The answers regarding the different levels of the management pyramid are shown in table 4.03.

Table 4.0-2: General information on the management system (overall)

Information	Date	
	31.12.1999	31.12.2008
management system available	60 %	97 %
no management system available	30 %	0 %
no entry	10 %	3 %

Table 4.0-3: Information on the management system (management level)

Information	Date	
	31.12.1999	31.12.2008
level „policy“		
entry available	60 %	94 %
no entry (level missing)	0 %	3 %
no management system available	30 %	0 %
no entry	10 %	3 %
level „management manual“		
entry available	55 %	97 %
no entry (level missing)	5 %	0 %
Kein Managementsystem vorhanden	30 %	0 %
no entry	10 %	3 %
level „process instruction“		
entry available	57 %	95 %
no entry (level missing)	3 %	2 %
no management system available	30 %	0 %
no entry	10 %	3 %
level „operating instructions“		
entry available	53 %	89 %
no entry (level missing)	7 %	8 %
no management system available	30 %	0 %
no entry	10 %	3 %
level „related documents“		
entry available	50 %	92 %
no entry (level missing)	10 %	5 %
no management system available	30 %	0 %
no entry	10 %	3 %

Entries from the questionnaires (exp.):

- level „policy“

  reference date 31 December 1999: *Unternehmenspolitik, Konzernvorgaben, Leitlinien, Managementpolitik, Umweltpolitik, Politik, Leitbild, Ziele, Geschäftsführer.*

  reference date 31 December 2008: *Unternehmenspolitik, Konzernvorgaben, weltweite Standards, Leitlinien, Managementpolitik, Qualitäts-, Umwelt-, Sicherheitspolitik, Umwelt- und Arbeitsschutzpolitik, Politik, Policy, Leitbild, Ziele, Responsible Care Verpflichtung, Geschäftsführer*.

- level „management manual“

  reference date 31 December 1999: *QM, UM, SM, Managementhandbuch, QM-Handbuch, Umweltmanagementhandbuch, Konzernumweltrichtlinien, Standortumweltrichtlinien, Handbuch, Regelungen, Werkspezifische Regelungen, Richtlinien und Handbücher, M&O-Handbuch, Organisationshandbuch, Handbuch Sicherheit-Gesundheit-Umweltschutz, Organisation Verantwortlichkeiten, Störfallbeauftragter*.

reference date 31. December 2008: *QMH, QM, UM, SM, Managementhandbuch, Managementhandbuch inkl. Politik, QM-Handbuch, UHB, TQM-Handbuch, Handbuch, Globale Anforderungen, Beschreibung des Betriebsbereiches, Handbuch Umweltschutz und Sicherheit, Handbuch zum Integrierten Managementsystem, Managementsystem integriert, Betriebshandbücher für Anlagen, Organisationshandbücher für Servicebereiche, Anlagen-/ Betriebshandbücher, IMS-Handbuch, Betriebssicherheitshandbuch, Sicherheits-Managementhandbuch, SMH, Sicherheitskonzept, Handbuch Sicherheit-Gesundheit-Umweltschutz, Corporate Standards, Grundlegende Informationen, Betriebsanleitung, Organisation Verantwortlichkeiten, Störfallbeauftragter / Abteilungsleiter*.

- level „process instruction“

  reference date 31 December 1999: *Verfahrensanweisungen, Planung Verfahrensanweisungen, Verfahrens- und Betriebsanweisungen, Konzernumweltrichtlinien / Standortumweltrichtlinien, Prozesshandbuch, Richtlinien, Standards, Werkprozeduren*.

  reference date 31. December 2008: *QMA / UMA, SK/ SMS/ AGAP, Verfahrensanweisungen, Planung Verfahrensanweisungen, Prozessbeschreibungen, Prozesshandbuch, Prozesse mit Unterpunkten, Standortübergreifende Gruppenprozeduren, Werkprozeduren, SM-VA QM-VA QM-B, Richtlinien*.

- level „operating instructions“

  reference date 31 December 1999: *Arbeitsanweisungen, Arbeits- und Prüfanweisungen, Umweltarbeitsanweisungen, Arbeitsanweisungen/Job-Sicherheitsanalysen, Betriebsanweisungen, Prozeduren als Verfahrens-/Arbeitsanweisungen*.

  reference date 31. December 2008: *Arbeitsanweisungen, Arbeits- und Prüfanweisungen, Umweltarbeitsanweisungen, Betriebsanweisungen, Analysenvorschriften, Arbeitsplatz bezogene Dokumente, Arbeits - und Kalibrieranweisungen, Prüfvorschriften, Gefährdungsbeurteilung*.

- level „related documents“

  reference date 31 December 1999: *mitgeltende Dokumente, gesetzliche Grundlagen, QM-Aufzeichnungen, sonstige Dokumente, Auditierung, Formblätter Anlagen etc., Formulare, Listen*.

  reference date 31. December 2008: *mitgeltende Dokumente, technische Unterlagen, sonstige Dokumente, Checklisten, mitgeltende Unterlagen, Regelungen, Formblätter Anlagen etc., Formulare, Listen, betriebliches Regelwerk, Dokumentation*.

4.1 Organisation and personnel

Question 1.1: What changes of the existing organisational structure resulted from the implementation of the SMS?

Response

- tasks and responsibilities of existing organisational units or positions were modified
  - totally: 41 %
  - exclusively: 23 %
- jobs/positions requiring new qualifications were added
  - totally: 25 %
  - exclusively: 10 %
- no change; tasks and objectives of the SMS were already considered in the existing organisational structure: 46 %
- no entry: 3 %

Additional explanations (questionnaires):

- tasks and responsibilities of existing organisational units or positions were modified:

  Managementbeauftragter und IM-Team; Erweiterung der Aufgaben von bestehenden Funktionen; Bestellung eines UMB; Benennung Störfallbeauftragter; Hervorhebung der Zuständigkeiten bzgl. SMS, Einführung der Funktion Managementbeauftragter; 2 Stellen, die die Durchführung neu eingeführter Sicherheitsaudits übernommen haben; Dokumentationen, Schulungen, Arbeitssicherheitsverfahren, Inbetriebnahme einer Anlage; SMS wurde ins QS- System integriert.
- jobs/positions requiring new qualifications were added:

  Dokumentationsstelle; div. Beauftragtenfunktionen; Störfallbeauftragter; Managementbeauftragter; HSSE-Koordinator.
- no change:

  vorhandenes SMS deckte eingeführtes weitgehend ab; gem. ISO 9000 ff; alle wesentlichen Funktionen bereits vorhanden; wurden in die bestehende Organisationsstruktur integriert; die Aufgaben, die sich aus dem SMS ergeben, wurden innerhalb der bereits vorhandenen Struktur abgebildet, hierzu wurden die Regelungen ergänzt/angepasst.

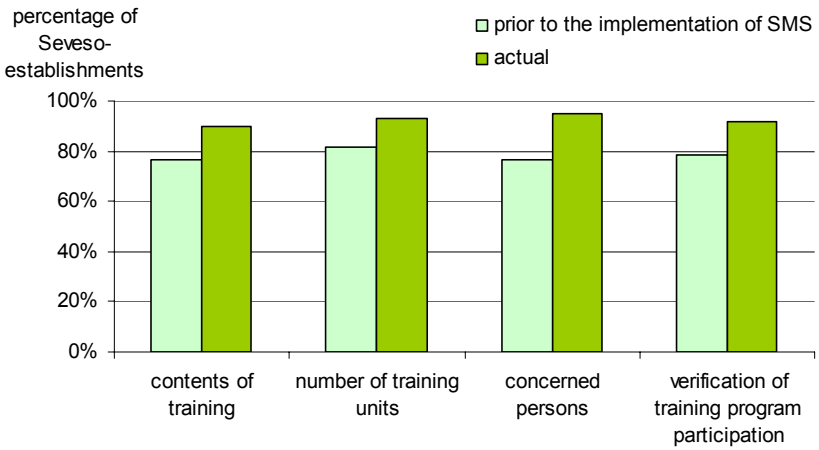
Question 1.2: Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?

Did a corresponding regulation exist prior to the implementation of the SMS?

Response

- currently, for the Seveso-establishment regulations are provided covering
  - contents of training: 90 %
  - number of training units: 95 %
  - concerned persons: 95 %
  - verification of training program participation: 92 %
- the percentage growth compared to the period prior to the implementation of SMS is 14 % on average, and in detail
  - contents of training: +12 %
  - number of training units: +12 %
  - concerned persons: +19 %
  - verification of training program participation: +14 %
- for about half (47 %) of the Seveso-establishments regulations exist continuously covering all subjects named above
- information on the title of written regulations are given for
  - contents of training: 51 %
  - number of training units: 47 %
  - concerned persons: 46 %
  - verification of training program participation: 39 %

Figure 4.1-1: Written regulations for training programs



Question 1.2.1: Has the participation in the training program been verified since implementation of the SMS?

Response

- verification according to a defined timing
  - totally: 69 %
  - exclusively: 53 %
- verification for especial cause
  - totally: 28 %
  - exclusively: 12 %
- verification according to a defined timing and for especial cause: 16 %
- other: 12 %
- no verification: 5 %
- no entry: 2 %

Additional explanations (questionnaires):

- verification according to a defined timing:

  2 Jahre; 14 Tage nach Schulung; nach festgelegten Schulungsterminen; Abgleich Schulungsplan; Sicherheitsschulung halbjährlich; einmal pro Jahr; interne Audits; Vorgaben der Rechtssprechung
- verification for especial cause:

  Inspektion; interne/externe Audits; bei neuen MA; Auswertung von Ereignissen; bei Veränderungen
- other:

  Ständige Überwachung / DV; durch Führungskraft; Stichproben; externe Überprüfung durch Überwachungsbehörden

Question 1.2.2: Have the training programs been modified since the implementation of the SMS?

a) safety related contents of training programs

Response

- new subjects or focussing of subjects, especially safety related contents
  - totally: 80 %
  - exclusively: 26 %

- special training or extension of training for external staff
  - totally: 52 %
  - exclusively: 2 %
- no modification of training program contents: 18 %
- other: 3 %
- no entry: 0 %

Additional explanations (questionnaires):

- new subjects or focussing of subjects:

  Störfallrecht, 12. BImSchV; interne und gesetzliche Vorgaben; Schulungen für Werkschutz zum Verhalten bei Störfällen; Gefahrstofflagerung; SMS/Organisation, technische Überwachung, Gefahrenabwehr; Schulung zum Störfallbeauftragten / zur Durchführung von Sicherheitsaudits; Beinahunfälle, BA-Gefahrenstoffverarbeitung; Überarbeitung Themen, kontinuierliche Anpassung; Arbeitssicherungsverfahren und Schulung von Fremdpersonal über Gefahrenquellen und Verhalten im Störfall; Notfallmanagement, Maßnahmen im Ereignisfall; Reaktor-Safety, Prozess-Sicherheitstrainings, Störfalltraining
- training for external staff:

  als einmalige Einweisung und in schriftlicher Form; Ausbildung interner Einsatzkräfte; Evakuierung; Unterweisung Wartungspersonal u., LKW-Fahrer; Betriebsordnung für Fremdfirmen; Brandschutzschulungen, Infoblatt für Fremdfirmen; Schulungen im Hinblick auf besondere Tätigkeiten; Schulung von Fremdpersonal über Gefahrenquellen und Verhalten im Störfall; Trainings über Prozessgefahren; Schulung Vorgesetzte der Rahmenvertragsfirmen zweijährlich; Sicherheitsbroschüre; haftungsrechtliche Gründe
- other:

  interne Ausbildung von neuem Personal; Heißerlaubnisscheinverfahren, Fremdfirmenmanagement; Anpassung erfolgen z.B. auch entsprechend der Veränderungen der Gesetzgebung.

Question 1.2.2 b) number of safety related training units

Response

- more frequent: 52 %
- less frequent: 0 %
- constant: 43 %
- other: 0 %
- no entry: 5 %

Additional explanations (questionnaires):

- more frequent:

  hauptsächlich interne Schulungen; gesetzliche Vorgaben und eigener Schulungsbedarf; 2 x jährlich; 5x/a, speziell für den Betriebsbereich; 1 x jährlich bzw. bei Bedarf; 1 – 4 x pro Jahr; Wiederholungstrainings mit unterschiedlichen Intervallen.

Question 1.2.2 c) extension of the personnel to be concerned in safety related training; involving additional persons or organisational units

Response

- internal staff
  - totally: 52 %
  - exclusively: 5 %
- external staff
  - totally: 54 %
  - exclusively: 10 %
- internal and external staff: 44 %
- no change of the personnel to be concerned: 36 %
- other: 0 %
- no entry: 5 %

Additional explanations (questionnaires):

- internal staff:

  Arbeitsschutz, Instandsschutz, Anlagenbetreiber
- external staff:

  Fremdwartenpersonal, Dienstleister, Werkschutz, externe Sicherheitsfachkraft, Werksarztzentrum

Question 1.3: Are there written regulations provided for selection and placement of personnel covering stipulations for the following subjects?

Did a corresponding regulation exist prior to the implementation of the SMS?

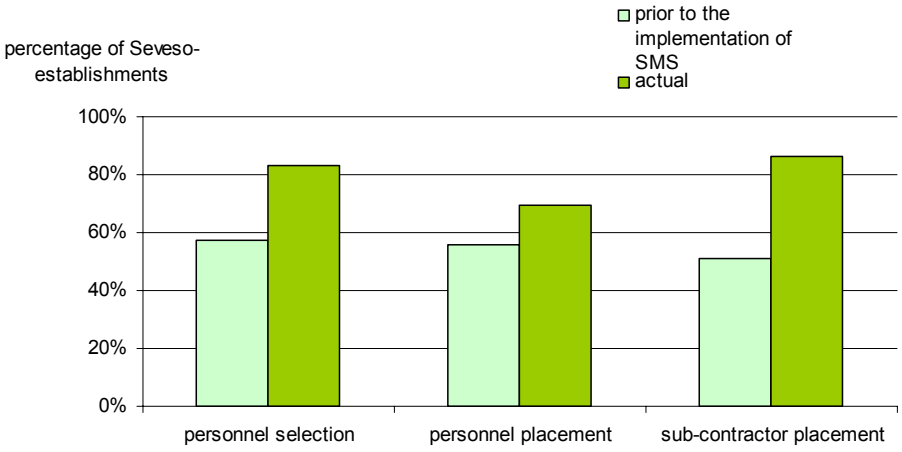
Response

- currently, for the Seveso-establishment regulations are provided covering

- criteria for personnel selection: 83 %
- criteria for personnel placement: 69 %
- criteria fort sub-contractor placement: 86 %

- the percentage growth compared to the period prior to the implementation of SMS is 14 % on average, and in detail
  - criteria for personnel selection: +26 %
  - criteria for personnel placement: +14 %
  - criteria for sub-contractor placement: +36 %

Figure 4.1-2: Written regulations for personnel selection and personnel placement



- for 66 % of the Seveso-establishments regulations exist covering all subjects named above (prior to the implementation of SMS: 39 %)
- information on the title of written regulations are given for
  - criteria for personnel selection: 51 %
  - criteria for personnel placement: 37 %
  - criteria for sub-contractor placement: 51 %

Question 1.3.1: Have the criteria for selection and placement of personnel been changed since the implementation of the SMS?

Response

- increased consideration of safety related competences in decisions made to define tasks and responsibilities of the internal staff
  - totally: 44 %
  - exclusively: 11 %

- increased consideration of safety related competences for the selection of sub-contractors
  - totally: 43 %
  - exclusively: 10 %
- increased consideration of safety related competences for selection and placement of internal and external staff: 33 %
- no change: 41 %
- other: 0 %
- no entry: 5 %

Additional explanations (questionnaires):

- criteria for internal staff:

  Thema verstärkt Teil der Schulungen; Vorgabe, dass das Personal Qualifikation als befähigte Person nach TRBS 1203 erfüllen muss; Mitarbeiter gemäß SMH geschult und eingewiesen.
- criteria for sub-contractors:

  Angebotsprüfung/Vorgaben gesetzl. Regelungen (Vwas zugelassen, Fachbetrieb…); Fremdfirmenmanagement; VA Vergabe/Abwicklung sicherheitsrelevanter Dienstleistungen. Bei Fremdfirmen steht Qualifikation im Vordergrund; Arbeiten seit Jahren mit festen Partnern.

4.2 Identifikation and evaluation of major hazards

Question 2.1: Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?

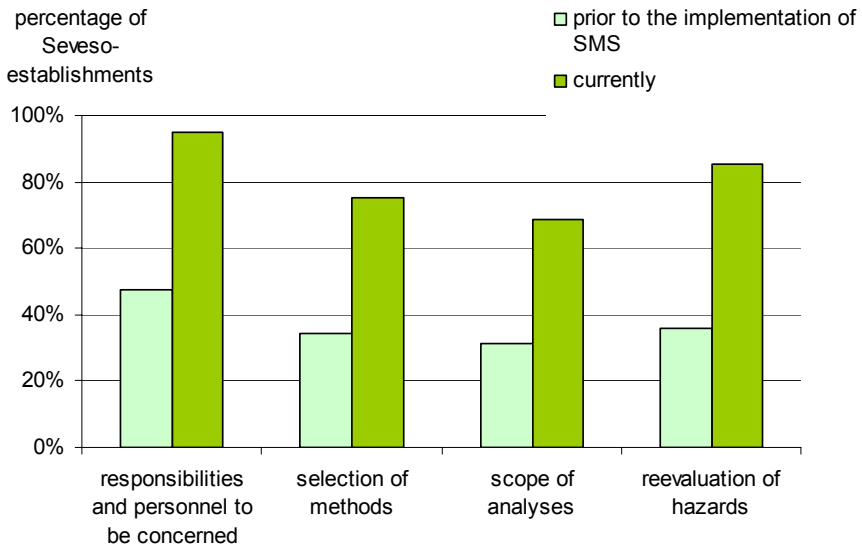
Did a corresponding regulation exist prior to the implementation of the SMS?

Response

- currently, for the Seveso-establishments regulations are provided covering
  - responsibilities and personnel to be concerned: 95 %
  - selection of analyses methods: 75 %
  - scope of the analyses: 69 %
  - reevaluation of hazards: 85 %
- the percentage growth compared to the period prior to the implementation of SMS is 44 % on average, and in detail
  - responsibilities and personnel to be concerned: +48 %
  - selection of analyses methods: +41 %

- scope of analysis: +38 %
- reevaluation of hazards: +49 %

Figure 4.2-1: Written regulations for the identification and evaluation of major hazards



- for 56 % of the Seveso-establishment regulations exist covering all subjects named above (prior to the implementation of SMS: 23 %).
- information on the title of written regulations are given for
  - responsibilities and personnel to be concerned: 59 %
  - selection of analyses methods: 48 %
  - scope of analyses: 39 %
  - reevaluation of hazards: 48 %

Question 2.1.1: Has a reevaluation of major hazards been performed since the implementation of the SMS?

Response

- existing analyses were verified
  - totally: 52 %
  - exclusively: 15 %
- analyses considering a modified scope
  - totally: 36 %
  - exclusively: 7 %
- analyses considering new methods

  - totally: 33 %
  - exclusively: 2 %
- additional analyses for scenarios not considered as yet (e. g. hazards, source term, impacts)
  - totally: 44 %
  - exclusively: 3 %
- a reevaluation was not necessary: 23 %
- other (here: „expert review“): 2 %
- no entry: 3 %

Additional explanations (questionnaires):

- existing analyses were verified:

  externe Regelbetreuung; Umbau Sicherheitsanalyse zum Sicherheitsbericht; Erstellung/Bearbeitung Sicherheitsbericht, sicherheitstechnische Bewertung; diverse PAAG; Anpassung an geänderte Rechtsvorschriften und Kundenanforderungen.
- analyses considering a modified scope:

  im Rahmen des Sicherheitsberichts, Einbeziehung weiterer Anlagen; diverse PAAG.
- analyses considering new methods:

  Sicherheitsbericht; Abgleich mit neuere Normung; Verfahren verfeinert; Ausfalleffektanalyse: Gefahrenanalyse PAAG; FMEA; Dennoch- Betrachtungen im allgemeinen Teil des Sicherheitsberichtes.
- additional analyses:

  Sicherheitsbericht, Katastrophenszenarien, Dennoch-Störfälle, neue Brandfallbetrachtung, PAAG, Sicherheitsanalyse "angrenzende Rohrleitung“.

4.3 Operational control

Question 3.1: Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?

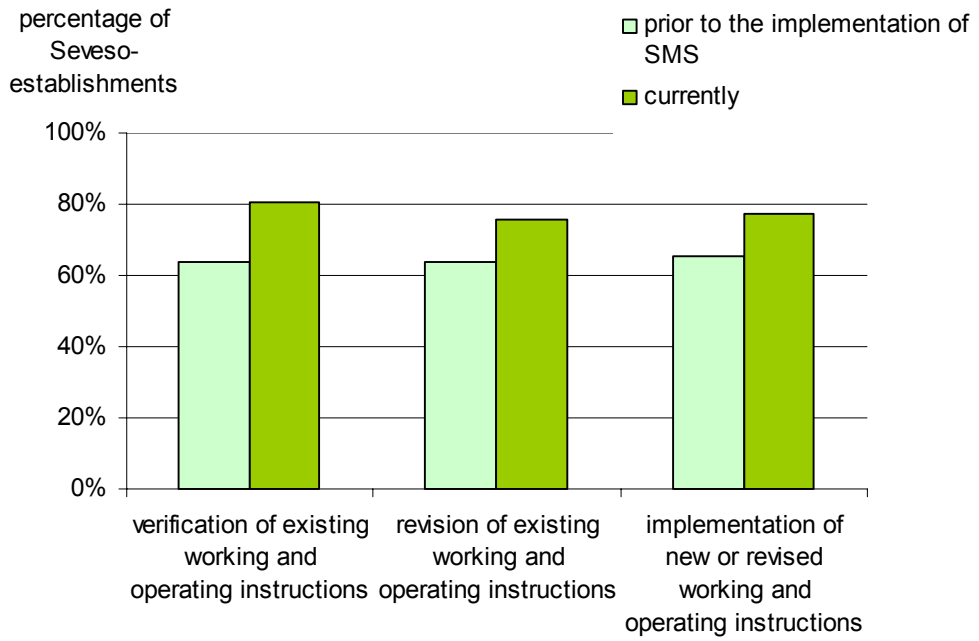
Did a corresponding regulation exist prior to the implementation of the SMS?

Response

- currently, for the Seveso-establishments regulations are provided covering
  - verification of existing working and operating instructions: 80 %
  - revision of existing working and operating instructions: 75 %

– implementation of new or revised working and operating instructions: 77 %

Figure 4.3-1: Written regulations for the operational control



- the percentage growth compared to the period prior to the implementation of SMS is 13 % on average, and in detail
  - verification of existing working and operating instructions: +16 %
  - revision of existing working and operating instructions: +11 %
  - implementation of new or revised working and operating instructions: +11 %
- for 67 % of the Seveso-establishment regulations exist covering all subjects named above (prior to the implementation of SMS: 56 %).
- information on the title of written regulations are given for
  - verification of existing working and operation instructions: 48 %
  - revision of existing working and operation instructions: 44 %
  - implementation of new or revised working and operation instructions: 44 %

Question 3.1.1: What effects on working and operating instructions were caused by the implementation of the SMS?

a) What changes were caused by the implementation of the SMS?

Response

- existing working and operating instructions were verified

  - totally: 66 %
  - exclusively: 7 %
- existing working and operating instructions were revised
  - totally: 62 %
  - exclusively: 2 %
- additional working and operating instructions were initially released
  - totally: 61 %
  - exclusively: 3 %
- no change: 16 %
- other: 0 %
- no entry: 7 %

Additional explanations (questionnaires):

- verification and revision of existing working and operating instructions:

  im Rahmen/Vorbereitung auf TSM-Zertifizierung; gemäß SMH; SHE-Checkliste in Prozedur; gehört zur Routine, nicht neu aufgrund SMS.
- initial release of additional working and operating instructions:

  im Rahmen/Vorbereitung auf TSM-Zertifizierung; gehört zur Routine, nicht neu aufgrund SMS; nach Notwendigkeit; schon vor Einführung SMS im Rahmen der Gefährdungsbeurteilung).

Question 3.1.1 b) What was the reason for the modification of working and operating instructions?

Response

- change of the process, input of substances, etc.: totally 57 %
- operational experience (incidences, disturbances): totally 77 %
- amended regulations: totally 82 %
- hazard analyses: totally 64 %
- other: totally 7 %
- no entry: 11 %

Just for one Seveso-establishment the modification of working and operating instructions resulted from a hazard analysis. For all the rest of the Seveso-establishments several of the reasons named above were relevant. For 43 % of the Seveso-establishments all of the options (except for “other”) were important.

Additional explanations (questionnaires):

- change of the process, input of substances, etc.:
  bei Bedarf.
- operational experience:
  Überarbeitung infolge der allgemeinen Betriebserfahrung; Erfahrungen zeigen Gefahrenquellen, die in neuen Anweisungen berücksichtigt werden
- amended regulations:
  Anpassung an Regelwerk
- hazard analyses:
  Überprüfung und Anpassung des Wissensstandes der Mitarbeiter durch Sicherheitsaudits, Sensibilisierung durch Mitwirkung bei Fragebogen für Sicherheitsaudit; Gefährdungsbeurteilung; nach Störfällen / Unfällen
- other:
  Genehmigungsauflagen, Inspektion, interne Audits

4.4 Safe management of changes

Question 4.1: Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?

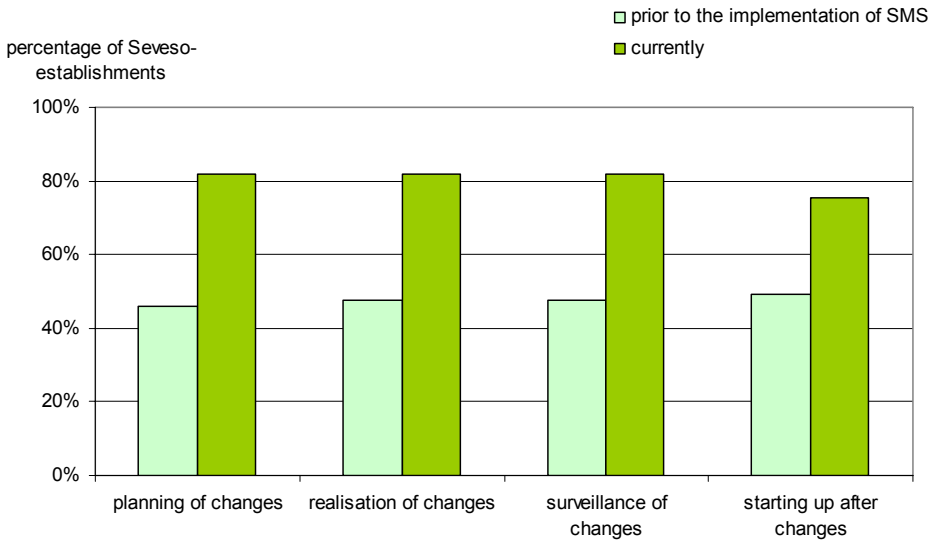
Did a corresponding regulation exist prior to the implementation of the SMS?

Response

- currently, for the Seveso-establishment regulations are provided covering
  - planning of changes: 82 %
  - realisation of changes: 82 %
  - surveillance of changes: 82 %
  - starting up after changes: 75 %
- the percentage growth compared to the period prior to the implementation of SMS is 33 % on average, and in detail
  - planning of changes: +36 %
  - realisation of changes: +34 %

- surveillance of changes: +34 %
- starting up after changes: +26 %

Figure 4.4-1: Written regulations for the safe management of changes



- for about three quarters (72 %) of the Seveso-establishments regulations exist for all subjects named above (prior to the implementation of SMS: 44 %)
- information on the title of written regulations are given for
  - planning of changes: 51 %
  - realisation of changes: 49 %
  - surveillance of changes: 48 %
  - starting up after changes: 46 %

Question 4.1.1: What changes resulted from the implementation of the SMS?

a) revision of rules for the management of changes

Response

- existing rules were verified
  - totally: 66 %
  - exclusively: 5 %
- specific rules were added
  - totally: 59 %

  - exclusively: 5 %
- existing rules were modified
  - totally: 61 %
  - exclusively: 10 %
- no change, existing rules are sufficiently: 10 %
- no entry: 10 %

Additional explanations (questionnaires):

- existing rules were verified:

  Arbeits- und Betriebsanweisungen; Routine, nicht neu aufgrund SMS; zuvor gab es in den Produktionsbetrieben diverse Papier-Lösungen
- specific rules were added:

  Notfallplan, Arbeits- und Verfahrensanweisungen, Durchführung von Änderungen; Freigabe Betriebsanlagen; Routine, nicht neu aufgrund SMS; Abläufe von Änderungsmaßnahmen
- existing rules were modified:

  schriftliche Dokumentation; Routine, nicht neu aufgrund SMS

Question 4.1.1: b) How have the personnel been instructed after the realisation of changes regarding the consequences of the changes?

Response

- training contents were extended
  - totally: 67 %
  - exclusively: 28 %
- additional personnel or organisational units were involved in the training
  - totally: 43 %
  - exclusively: 7 %
- number of training units was modified
  - totally: 25 %
  - exclusively: 0 %
- no changes: 10 %
- other: 8 %
- no entry: 8 %

Additional explanations (questionnaires):

- contents of the training were extended

  Erweiterung wg. Veränderung StörfallV, nicht wg. SMS; Veränderung aufgrund geänderter Randbedingungen/neuer Informationsstand; Anpassung an überarbeitete Anweisung; gezielte Mitarbeiter-Schulung
- additional personnel or organisational units were involved in the training:

  externe Schulungsträger; Fachkraft für Arbeitssicherheit; Unterstützung des Sicherheitsbeauftragte durch Störfallbeauftragten und externe Sicherheitskraft
- number of training units was modified:

  deutlich erhöht
- other:

  Änderungsmanagement; ggf. Schulung neue Regelungen und neue Fließbilder; Unterweisung durch QS/Werksarztzentrum und schriftliche Dokumentation; gemeinsame Erarbeitung der Änderung; Gespräche über Inhalte des SMS.

Question 4.2: What experience resulted from the implementation of rules for the safe management of changes?

a) progression of effort (time, personnel) all in all for the realisation of changes.

Response

- increased effort: 66%
- decreased effort: 2 %
- no change: 26 %
- no entry: 6 %

Additional explanations (questionnaires):

- increased effort:

  Dokumentationsumfang höher; höherer Abstimmungs- / Kontrollaufwand; Schulung; kleiner Änderungen werden jetzt betrachtet
- no change:

  war schon immer hoher Aufwand; konkrete Aufwandsänderung konnte nicht festgestellt werden.

Question 4.2 b) trend: number of faults occurring as a consequence of changes

Response

- increase, more faults: 5 %
- decrease, less faults: 35 %
- no change: 49 %
- other: 3 %
- no entry: 8 %

Additional explanations (questionnaires):

- decrease, less faults:
  durch sensiblere Vorgehensweise
- no change:
  Änderungsmaßnahmen wurden aus sicherheitstechnischen Gründen immer sorgfältig durchgeführt, Mängel waren immer niedrig
- other:
  besseres Betriebsklima durch bessere Information; detaillierte Dokumentation erleichtert Nachvollziehbarkeit für Dritte; zunehmendes Verantwortungsbewusstsein und gesteigerte Kommunikation von Themen wie Sicherheit und Gesundheit, SMS wird vermehrt von Kunden gefordert und von allen Beteiligten akzeptiert und umgesetzt; noch keine Erkenntnisse

4.5 Planning for emergencies

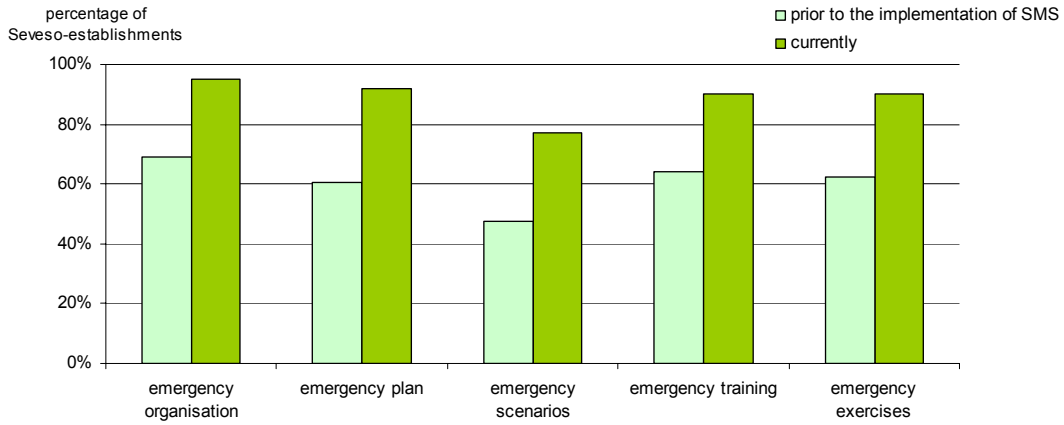
Question 5.1: Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?

Did a corresponding regulation exist prior to the implementation of SMS?

Response

- currently, for the Seveso-establishments regulations are provided covering
  - emergency organisation: 95 %
  - emergency plans: 92 %
  - emergency scenarios: 77 %
  - emergency training: 90 %
  - emergency exercise: 90 %

Figure 4.5-1: Written regulations for the planning for emergencies



- the percentage growth compared to the period prior to the implementation of SMS is 28 % on average, and in detail
  - emergency organisation: +26 %
  - emergency plans: +31 %
  - emergency scenarios: +30 %
  - emergency training: +26 %
  - emergency exercise: +28 %
  - no entry: 2 %
- for about two thirds (67 %) of the Seveso-establishments regulations exist for all subjects named above (prior to the implementation of SMS: 33 %)
- for the Seveso-establishment regulations are provided at least for one of the subjects named above
  - currently : 98 %
  - prior to the implementation of the SMS: 77 %
- the Seveso-establishments which had no regulations for the planning for emergencies (21 % of the total number) had been prior to the implementation of the SMS
  - subject to the „basic obligations“: 31 %
  - in addition subject to the „extended obligations“: 69 %
- information on the title of written regulations are given for
  - emergency organisation: 54 %
  - emergency plans: 52 %
  - emergency scenarios: 44 %

- emergency training: 49 %
- emergency exercise: 48 %

Question 5.1.1: What changes resulted from the implementation of the SMS?

a) emergency organisation

Response

- change of the internal organisational structure
  - totally: 41 %
  - exclusively: 8 %
- change of communication and cooperation with other parties
  - totally: 54 %
  - exclusively: 21 %
- no change: 28 %
- other: 3 %
- no entry: 7 %

Additional explanations (questionnaires):

- change of the internal organisational structure:

  Werkseinsatzleitung; klare Zuweisung von Aufgaben; Neuaufbau; Anpassung an Erfordernisse; Einführung Krisenmanagement; Aufgabenverteilung entsprechend SMH; Delegation von Pflichten; Änderung nicht nur wegen SMS
- change of communication and cooperation with other parties:

  Einbeziehung Regierungsbezirk, lokale Behörden; Nachbarschaft, Polizei, Gewerbeaufsichtsamt; AGAP / Brandschutzordnung und externer Notfallplan des Kreises; Zusammenarbeit mit Nachbarfirmen; Fremdpersonal; gemeinsame Übungen mit Feuerwehr; Weiterentwicklung Nachbarschaftskommunikation; Eindeutige Regelung der Kommunikation durch Einführung SMH; Änderung nicht nur wegen SMS
- other:

  Änderungsmanagement; Ergänzung/Inbetriebnahme des 2. Betriebs

Question 5.1.1 b) emergency plans

Response

- change of the review cycle for emergency plans
  - totally: 33 %

  - exclusively: 21 %
- change of the proceeding used for the revision of the emergency plans
  - totally: 23 %
  - exclusively: 11%
- no change: 43 %
- initial release of emergency plans[3]: 5 %

  All the Seveso-establishments, which had no emergency plans prior to the implementation of SMS, are subject to the extended obligations according to the German Hazardous Incident Ordinance.
- other: 2 %
- no entry: 7 %

Additional explanations (questionnaires):

- change of the review cycle for emergency plans*:*

  jährliche Überprüfung; systematische Überprüfung
- change of the proceeding used for the revision of the emergency plans:

  systematische Überprüfung; umfangreicher; im Rahmen der Fortschreibung des Sicherheitsberichts, 4 x jährlich ASA-Sitzung
- other:

  Einführung AGAP; AGAP war vorher nicht vorhanden, nur Feuerwehreinsatzplan; Überarbeitung AGAP im Hinblick auf Störfall-Verordnung und mit Feuerwehr; Änderungsmanagement; nicht erforderlich, da Grundpflichten der Störfall-Verordnung

Question 5.1.1 c) emergency scenarios

Response

- new or modified emergency scenarios
  - totally: 41 %
  - exclusively: 11 %
- new or modified provisions for emergency response
  - totally: 43 %
  - exclusively: 13 %
- no change: 33 %

[3] The entries in the context of „other“ show that several Seveso-establishments had not any emergency plan prior to the implementation of the SMS. These answers are summarised in the category “initial release”

- other: 2 %
- no entry: 11 %

Additional explanations (questionnaires):

- new or modified emergency scenarios:

  innerhalb BAGAP; Hochwasser; im Rahmen der Fortschreibung des Sicherheitsberichts
- new or modified provisions for emergency response:

  systematische Betrachtung möglicher Szenarien; zusätzliche Kanalblase; innerhalb BAGAP; Hochwasserschutzbarrieren; Telefonliste für Störfall / Unterweisung Mitarbeiter; im Rahmen der Fortschreibung des Sicherheitsberichts
- other:

  Änderungsmanagement

Question 5.5.1 d) emergency training

Response

- increasing frequency
  - totally: 28 %
  - exclusively: 3%
- decreasing frequency: 2 %
- change of emergency training contents
  - totally: 50 %
  - exclusively: 23%
- change of methods (e. g. simulator)
  - totally: 15 %
  - exclusively: 0 %
- change of persons to be concerned (internal/external)
  - totally: 25 %
  - exclusively: 2 %
- no change: 23 %
- other: 3 %
- no entry: 10 %

Additional explanations (questionnaires):

- increasing frequency:
  intensivere Schulung
- change of emergency training contents:
  Einbeziehung Störfall-Verordnung; Schwerpunkt (2008) praktische Feuerwehrübung; speziell Verhalten bei Störfällen; auf Szenarien bezogen; wird bei internen Audits mit Schichtführern besprochen
- change of persons to be concerned (internal/external)
  Brandschutzbeauftragter, FASI, Externe; Feuerwehr, Fremdfirmen; Sicherheitsbeauftragter, Sicherheitsfachkraft; Notfallkräfte

Question 5.5.1 e) emergency exercise

Response

- increasing frequency
  - totally: 31 %
  - exclusively: 8 %
- decreasing frequency:
  - totally: 2 %
  - exclusively: 0 %
- change of emergency exercise contents
  - totally: 36 %
  - exclusively: 3 %
- change of methods:
  - totally: 10 %
  - exclusively: 0 %
- change of persons to be concerned (internal/external)
  - totally: 31 %
  - exclusively: 5 %
- no change: 31 %
- other: 5 %
- no entry: 10 %

Additional explanations (questionnaires):

- change of emergency exercise contents
  simulierter Notfall; auf Szenarien bezogen
- change of persons to be concerned (internal/external):
  externe Einsatzkräfte; Feuerwehr, Fremdfirmen; Notfallkräfte
- other:
  Notfallübung mit Feuerwehr; z. Zt. werden keine Notfallübungen durchgeführt.

4.6 Monitoring of SMS performance

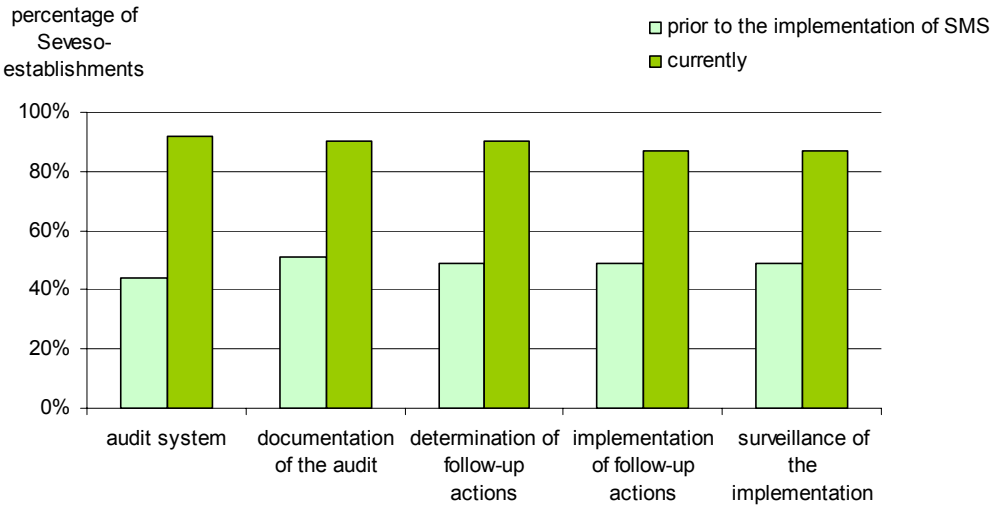
Question 6.1: Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?

Did a corresponding regulation exist prior to the implementation of the SMS?

Response

- currently, for the Seveso-establishments regulations are provided covering
  - verification, how the requirements on the SMS have been met by the Seveso-establishment (audit system): 92 %
  - documentation of the audit: 90 %
  - determination of actions resulting from the audits (follow-up actions): 90 %
  - implementation of follow-up actions: 87 %
  - surveillance of the implementation: 87 %
- the percentage growth compared to the period prior to the implementation of SMS is 41 % on average, and in detail
  - verification, how the requirements on the SMS have been met by the Seveso-establishment (audit system): +48 %
  - documentation of the audit: +39 %
  - determination of actions resulting from the audits (follow-up action): +41 %
  - implementation of follow-up action: +38 %
  - surveillance of the implementation: +38 %
- for 84 % of the Seveso-establishments regulations exist for all subjects named above (prior to the implementation of SMS: 43 %)

Figure 4.6-1: Written regulations for the monitoring of SMS performance



- information on the title of written regulations are given for
  - verification, how the requirements on the SMS have been met by the Seveso-establishment (audit system): 57 %
  - documentation of the audit: 48 %
  - determination of measures resulting from the audits (follow-up action): 51 %
  - implementation of follow-up action: 46 %
  - surveillance of the implementation: 48 %

Question 6.1.1 For what processes actions were deviated arising from the monitoring of SMS performance (audit)?

Response

- personnel training: 51 %
- selection and placement of personnel: 26 %
- identification and evaluation of major hazards: 43 %
- working and operating instructions: 56 %
- management of changes: 38 %
- planning for emergencies: 48 %
- no measures: 11 %
- other: 8 %
- no entry: 11 %

Additional explanations (questionnaires):

- personnel training:
  Überwachung und Durchführung; Werkschutz
- identification and evaluation of major hazards:
  Gefährdungsbeurteilung; im Rahmen der Fortschreibung des Sicherheitsberichts
- working and operating instructions:
  KVP; Detailverbesserungen; keine systematische Änderung, sondern Einzelmaßnahmen; müssen z. T. noch erstellt werden
- management of changes:
  KVP; keine systematische Änderung, sondern Einzelmaßnahmen
- planning for emergencies:
  Überarbeitung Dokumentation; Zusammenarbeit mit Feuerwehr
- other:
  Verbesserung Dokumentation Werkschutz; interne / externe Audits; SMS wächst permanent durch kontinuierliche Verbesserungsprozesse; noch keine Erkenntnisse

Question 6.2: Are there written regulations provided for the Seveso-establishment regarding the systematic evaluation of operational experience (e. g. internal reporting system) covering stipulations for the following subjects?

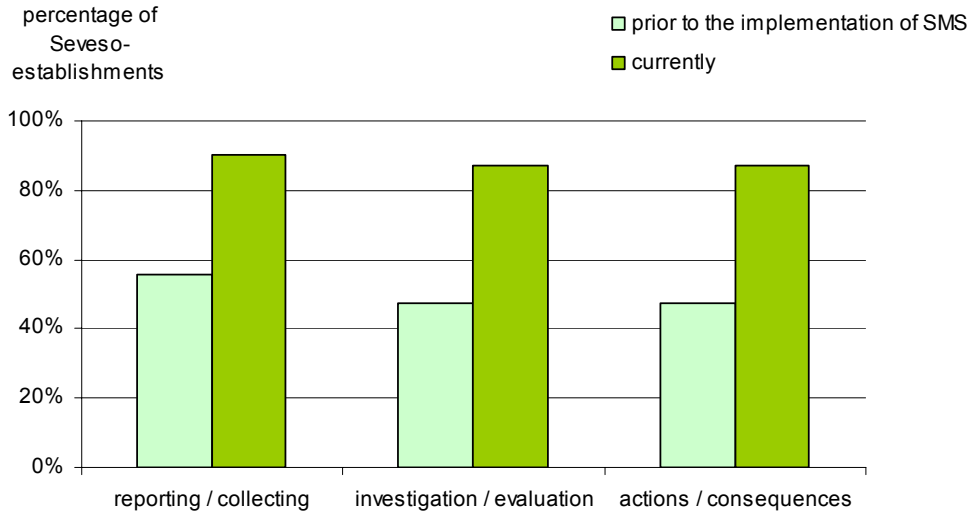
Did a corresponding regulation exist prior to the implementation of SMS?

Response

- currently, for the Seveso-establishment regulations are provided covering
  - reporting / collecting of events, incidents and disturbances: 90 %
  - investigation / evaluation of events, incidents and disturbances: 87 %
  - actions / consequences derived from the evaluation of events, incidents and disturbances: 87 %
- the percentage growth compared to the period prior to the implementation of SMS is 36 % on average, and in detail
  - reporting / collecting of events, incidents and disturbances: 34 %
  - investigation / evaluation of events, incidents and disturbances: 39 %

– measures / consequences derived from the evaluation of events, incidents and disturbances: 39 %

Figure 4.6-2: Written Regulations for „evaluation of operational experience“



- for 82 % of the Seveso-establishments regulations exist for all subjects named above (prior to the implementation of SMS: 44 %)
- information on the title of written regulations are given for
  - reporting / collecting of events, incidents and disturbances: 54 %
  - investigation / evaluation of events, incidents and disturbances: 48 %
  - actions / consequences derived from the evaluation of events, incidents and disturbances: 48 %

Question 6.2.1 Progression after the implementation of the SMS

a) reported deviations

Response

21 Seveso-establishments (34 %) have provided information on this question. For these Seveso-establishments the information concerning the total number of reported deviations and the number of safety related deviations are described in the following table.

The single data are not added up because the Seveso-establishments obviously use different criteria for the reporting and collecting of deviations (see also chapter 5)).

Table 4.6-1: Reported deviations per annum (2001 – 2009)

	Anzahl / Jahr															
	2001		2002		2003		2004		2005		2006		2007		2008	
No.	Σ	S	Σ	S	Σ	S	Σ	S	Σ	S	Σ	S	Σ	S	Σ	S
2	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
6	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1
7	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11	4	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
12	0	0	0	0	9	0	2	0	6	0	1	1	2	1	3	2
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
25	0	0	10	2	10	4	14	5	11	5	8	2	8	2	4	0
27	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	4	0	6	0	12	0	15	0	9	0
29	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
34	1	0	2	0	4	0	5	1	3	0	1	0	3	1	4	1
36	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
37	0	0	1	0	2	2	1	1	0	0	0	0	0	0	0	0
39	60		62		34		25		21		29		18		19	
41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
44	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
47	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0

No.: Seveso-establishment (consecutive numbering)
Σ: total number of reported deviations
S: number of safety related deviations

Question 6.2.1 b) What safety related measures were deviated from the evaluation of operational experience?

Response

- technical measures to improve safety
  - totally: 66 %
  - exclusively: 5 %
- organisational measures to improve effectiveness and reliability of safety related equipment
  - totally: 64 %
  - exclusively: 7 %
- modification of the management system
  - totally: 44 %
  - exclusively: 2 %
- measures to prevent operating errors
  - totally: 49 %
  - exclusively: 0 %

- no measures: 10 %
- other: 2 %
- no entry: 10 %

Additional explanations (questionnaires):

- technical measures to improve safety:

  Erweiterung der technischen Sicherheitseinrichtungen; Löschwasserversorgung stabilisiert; Kanalblase; fortlaufender Prozess; Einbau unabhängiger Überfüllsicherungen; Hochwasserschutzbarrieren; Brandmeldeanlage
- organisational measures to improve effectiveness and reliability of safety related equipment:

  Regelung in einer Arbeitsanweisung getroffen; Prüfung - Überwachung durch EDV; datenbankgestütztes Prüfhandbuch; VA Instandhaltungsplanung; Wartungsplan war vorher schon vorhanden, jetzt vervollständigt und dokumentiert
- modification of the management system:

  Dokumentationsänderung; VA Schulung u. Weiterbildung im Bereich Sicherheitstechnik; Schulungsplan/ Brandschutz etc.
- measures to prevent operating errors:

  Überdosierung; Anzahl Unterweisung
- other:

  Fremdverschulden

4.7 Management review

Question 7.1: Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?

Did a corresponding regulation exist prior to the implementation of the SMS?

Response

- currently, for 89 % of the Seveso-establishments regulations are provided for the management review (prior to the implementation of the SMS: 56 %)
- information on the title of written regulations are given for 56 % of the Seveso-establishments

Question 7.1.1: What changes of the SMS were deviated from the management review?

Response

- change of policy
  - totally: 23 %
  - exclusively: 3 %
- change of organisational structure
  - totally: 13 %
  - exclusively: 0 %
- change of measures to ensure compliance with the regulations of the SMS
  - totally: 23 %
  - exclusively: 5 %
- change of monitoring of SMS performance
  - totally: 13 %
  - exclusively: 2 %
- initial release of an internal reporting system for collecting and evaluating events, incidents and disturbances
  - totally: 15 %
  - exclusively: 3 %
- modification of an internal reporting system
  - totally: 11 %
  - exclusively: 3 %
- no changes: 33 %
- other: 7 %
- no entry: 16 %

Additional explanations (questionnaires):

- change of policy:
  Integration von Umweltschutz und Sicherheit; Einbeziehung HSSE
- change of organisational structure:
  Beauftragte MS, HSSE.
- change of measures to ensure compliance with the regulations of the SMS:
  SMS wurde ins QM-System integriert
- change of the monitoring of SMS performance:
  neu: Störungsfreier Betreib als Zielkennzahl formuliert

- initial release of an internal reporting system for collecting and evaluating events, incidents and disturbances:

  Ereignisbericht
- modification of an internal reporting system:

  monatlicher Berichterstattung eingeführt; Tanklager Dispo
- other:

  nach wie vor wirksam; eigener Punkt im Review (Anm.: Unternehmensziele); keine systematischen Änderungen, sondern Einzelmaßnahmen; es liegen noch keine Erkenntnisse vor

4.8 Other changes

Question 8.1 Have there been changes due to the implementation of the SMS but which are beyond the matter of plant safety?

Response

- cooperation with authorities
  - totally: 48 %
  - exclusively: 7 %
- advantage of the location
  - totally: 3 %
  - exclusively: 0 %
- effects on customer-supplier-relationship
  - totally: 16 %
  - exclusively: 0 %
- economic advantages (e. g. insurance, contracts)
  - totally: 11 %
  - exclusively: 0 %
- economic disadvantages (e. g. increasing administrative effort, additional personnel demand)
  - totally: 39 %
  - exclusively: 5 %
- change of personnel behaviour (e. g. frank communication)
  - totally: 36 %
  - exclusively: 2 %

- change of an existing management system due to the integration of the SMS
  - totally: 52 %
  - exclusively: 7 %
- no change: 10 %
- other: 2 %
- no entry: 7 %

Additional explanations (questionnaires):

- cooperation with authorities:

  Nachweise einfacher für Behördenumgang; SMS erleichtert die Transparenz des Unternehmens gegenüber der Behörden
- effects on customer-supplier-relationship:

  Akzeptanz
- economic disadvantages (e. g. increasing administrative effort, additional personnel demand):

  zu hoher administrativer Aufwand; erhöhter Aufwand da Behördenberücksichtigung; Personal, Administration; durch die erforderlichen Dokumentationen entsteht bei den betroffenen Personenkreis ein erheblicher Zeitaufwand, was die Produktivität senkt; erhöhter Aufwand, da jede Behörde ihre eigenen Vorstellungen berücksichtig wissen will; Dokumentation, Schulung
- change of personnel behaviour (e. g. frank communication):

  Vorschlagwesen; zusätzliche Sensibilisierung Beschäftigter für Anlagensicherheit; Mitarbeiter verhalten sich verantwortungsbewusster und sind auf Notfallsituationen besser vorbereitet
- change of an existing management system due to the integration of the SMS:

  Integration in das IMS; positive Veränderung; Erweiterung des Systems nach Entsorgungsfachbetriebverordnung um Belange SMS; integriert im QS- System; Umweltmanagementsystem das 90% des sms abdeckte war vorhanden

5 Evaluation and conclusions

5.0 Overriding aspects

5.0.1 General information

Question 0.1 General information on the Seveso-establishments.

- Industrial sector

  The reply to the questionnaires mainly comes from the sectors

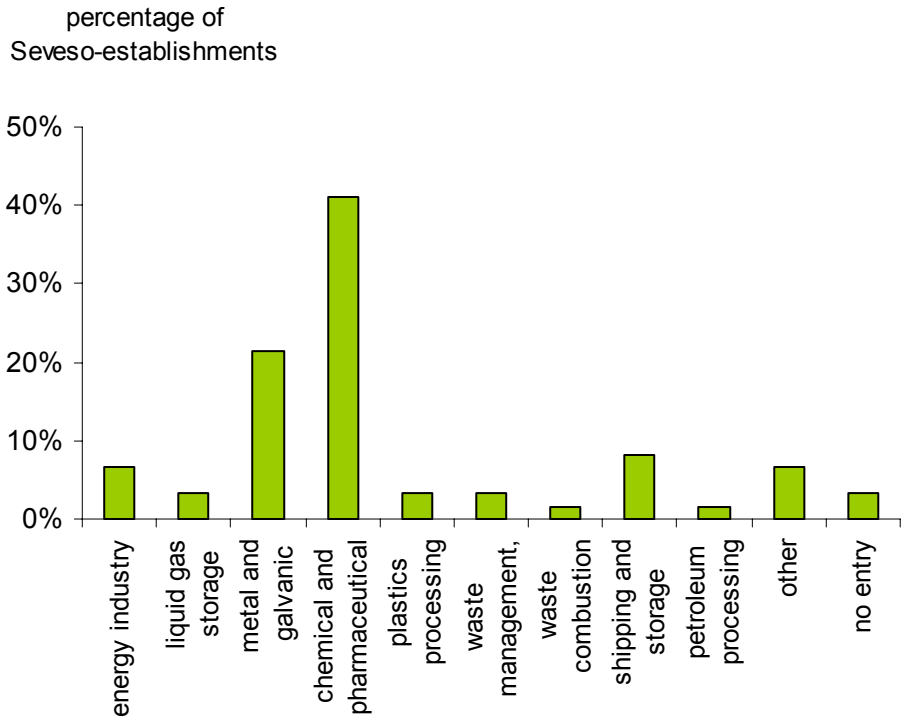
  – „chemical industry and pharmaceutical industry“ (41 %) as well as

  – „metal industry, iron and steal, galvanic industry“ (21 %).

  „Shipping and storage“, „energy industry“, „plastics processing“, „liquid gas storage“, „waste management, waste disposal, waste recycling“, „waste combustion“, „petroleum processing“ and „other“ are represented each covering percentages at maximum of 8 %.

  The reply considers relevant industrial key sectors. Due to the spreading of the answers an exclusive sectoral importance of the findings has not to be expected.

Figure 5.0-1: Distribution by industrial sector



- The Seveso-establishment is according to §1(1) of the German Hazardous Incident Ordinance …

  The questionnaire was sent to companies in North Rhine-Westphalia holding Seveso-establishments according to the German Hazardous Incident Ordinance. The Seveso-establishments in North Rhine-Westphalia belong to the basic obligations by a percentage of ca. 44 % and belong to the extended obligations by a percentage of ca. 56 %. Seveso-establishments with extended obligations are represented over average (69 %). This can be explained due to the fact that according to § 9 of the German Hazardous Incident Ordinance a description of the SMS is only required for Seveso-establishments with extended obligations. However, an important amount (29 %) of Seveso-establishments with basic obligations has participated in the questioning. The high percentage indicates that the SMS is implemented and is essential irrespective of the categories used in the German Hazardous Incident Ordinance.

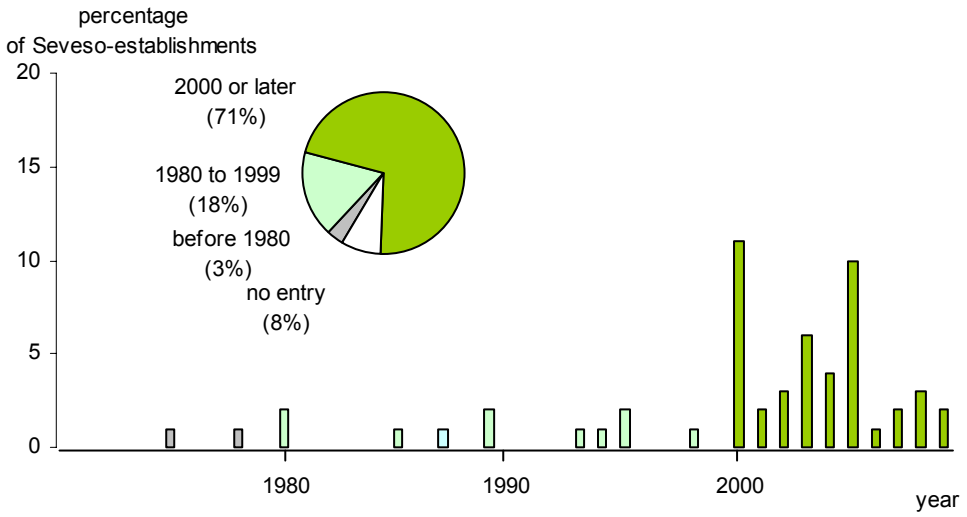
  Two dates are chosen here to split the dates as from the Seveso-establishments have been subject to the German Hazardous Incident Ordinance: In 1980 the German Hazardous Incident Ordinance came into force[4]. In 2000 the Seveso II-directive was transformed into German law, amongst other things requiring the SMS. The answers have been taken unmodified from the questionnaires. Two of the Seveso-establishments declare that they had been already in 1974 respectively in 1978 subject to the German Hazardous Incident Ordinance. However, the German Hazardous Incident Ordinance was enacted no more than 1980. These answers are not comprehensible.

  In the questioning mainly (71 %) Seveso-establishments have participated, which have been less than ten years subject to the German Hazardous Incident Ordinance.

  For Seveso-establishments, which have been quite recently subject to the German Hazardous Incident Ordinance, the changes resulting from the implementation of the SMS might be accompanied by changes resulting from other requirements beyond that. However, a questioning aimed at changes due to the SMS is practicable because many of the participants have gained experience for several years since the implementation of the SMS. 58 % of the Seveso-establishments have implemented the SMS between 2000 and 2005. Over the periods given thereby change processes may become apparent.

[4] Störfall-Verordnung of 27 Juni 1980 (BGBI. I S. 772)

Figure 5.0-2: How long has the Seveso-establishment been subject to the German Hazardous Incident Ordinance (number per annum)?



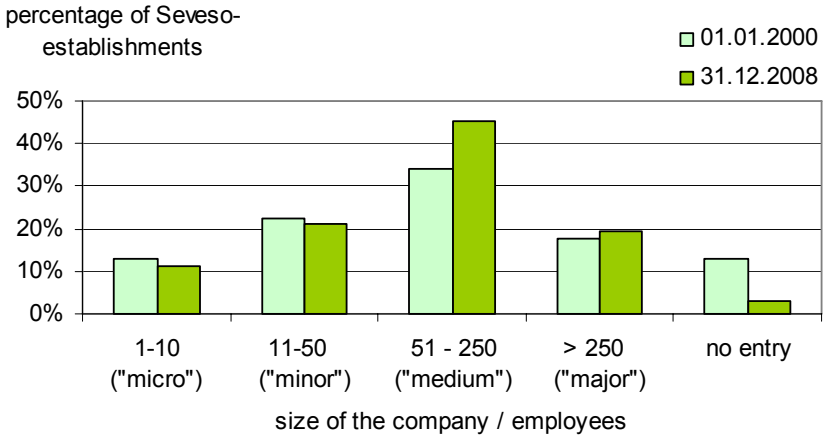
Seveso-establishments that have been subject for a longer time (implementation prior to 2000) to the German Hazardous Incident Ordinance have participated only on a limited scale (19 %). For these Seveso-establishments it might be assumed that by the time of implementation of the SMS a well developed organisational structure existed, for which the reorganisation caused by the SMS resulted in relevant changes. Management systems are established only for a few years. The low extend of participation might be reasoned by a reservation to publish the organisational consequences affected by the SMS. This aspect can not be investigated in detail in the context of this project.

- Size of the company, number of employees

  The number of employees in the Seveso-establishment was collected to characterise the size of the company.

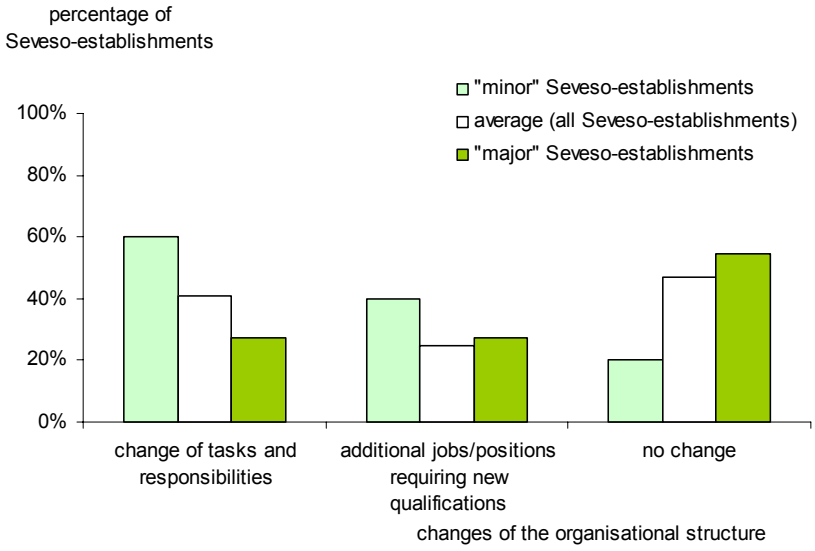
  The maximum value is located in the section „medium“ followed by approximately similar percentages of „minor“ und „major“ establishments. „Micro“ establishments (up to 10 employees) are represented holding about 10 %. The distributions before and after amending the German Hazardous Incident Ordinance in 2000 run similar in principle. The distribution moves a little towards larger establishments.

Figure 5.0-3: Distribution by size of the establishments



In detail no consistent trend can be seen regarding direction and amount of the changes. As shown in the additional explanations in several cases the variation of the size of a company is attributable to specific influences (change of siting, consolidation, production change, general economic growth), which are not in the context of the implementation of the SMS. About that, due to some comments it seems to be in question if the number of the personnel to be considered (e. g. headquarters, multiple sites) has been interpreted consistently.

Figure 5.0-4: Changes of the organisational structure according to the size of the establishments



The number of employees was questioned in the context of the organisational structure, which can show the effects of the SMS. The changes of the organisational structure for „minor“ and „major“ establishments were evaluated (see also chapter 4.1 and 5.1) and compared with the average on all Seveso-establishments (weighted by number).

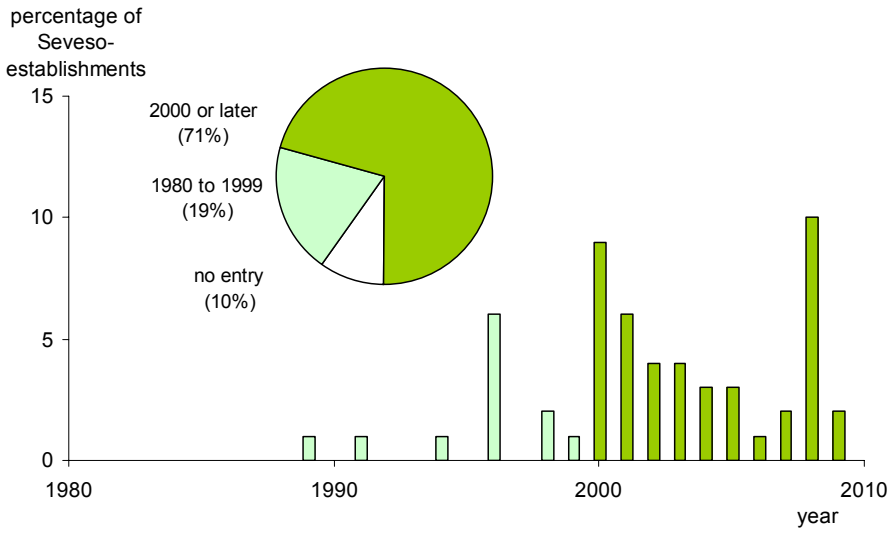
For the majority of „minor“ establishments the implementation of the SMS required a change of the organisational structure. The demand for adjustments was over average (changes of responsibilities, additional jobs). For „major“ establishments in many cases the existing organisation was yet in accordance with the demands of the SMS so that less changes were required. A reason might be that companies with many employees had a further developed organisation even based on a defined management system. Moreover, a larger organisation is more flexible to deal with additional requirements.

Question 0.2: General information on the Safety Management System (SMS).

- At what time the SMS was implemented in your Seveso-establishment?

  Dates as from 1989 were indicated. The most important impulse resulted from the stipulation of operator obligations referring to this in the German Hazardous Incident Ordinance. 71 % of the answers belong to the period as from 2000.

Figure 5.0-5: At what time the SMS was implemented in the Seveso-establishment (number per annum)?



It is illustrated that the implementation of SMS was not exclusively linked to the obligations of the German Hazardous Incident Ordinance:

- 19 % of the Seveso-establishments had held a SMS even before it was established as an operator obligation (prior to the enacting of the German Hazardous Incident Ordinance in 2000).
- 18 % of the Seveso-establishments had held a SMS even before they were subject to the German Hazardous Incident Ordinance.

Question 0.3: General information on the management system.

Describe the configuration of the management system in your Seveso-establishment at the following dates

- 31 December 1999 (prior to the implementation of the SMS)

- 31 December 2008 (current situation)

The implementation of the SMS influenced the development of the common management system, too. Currently, for nearly all the Seveso-establishments a management system is provided. Prior to the implementation of the SMS it applied to only 60 % of the Seveso-establishments.

The exemplified configuration was realised universally. The Seveso-establishments have partitioned the SMS into several levels. The expressions as used vary in parts but they can be assigned to the different levels of the management pyramid. The percentage of Seveso-establishments using a smaller number of levels is less than 10 %.

All in all the SMS has caused the development of a consistent and well-structured configuration even of the common management system.

5.0.2 Written regulations

Question: Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects? …

Did a corresponding regulation exist prior to the implementation of the SMS?

In detail the following subjects are mentioned:

Question 1.2 Regulations for training programs

Question 1.3 Regulations for personnel selection and personnel placement.

Question 2.1 Regulations for identification and evaluation of major hazards

Question 3.1 Regulations for operating instructions

Question 4.1 Regulations for safe management of changes

Question 5.1 Regulations for planning for emergencies

Question 6.1 Regulations for monitoring of SMS Performance

Question 6.2 Regulations for evaluation of operational experience

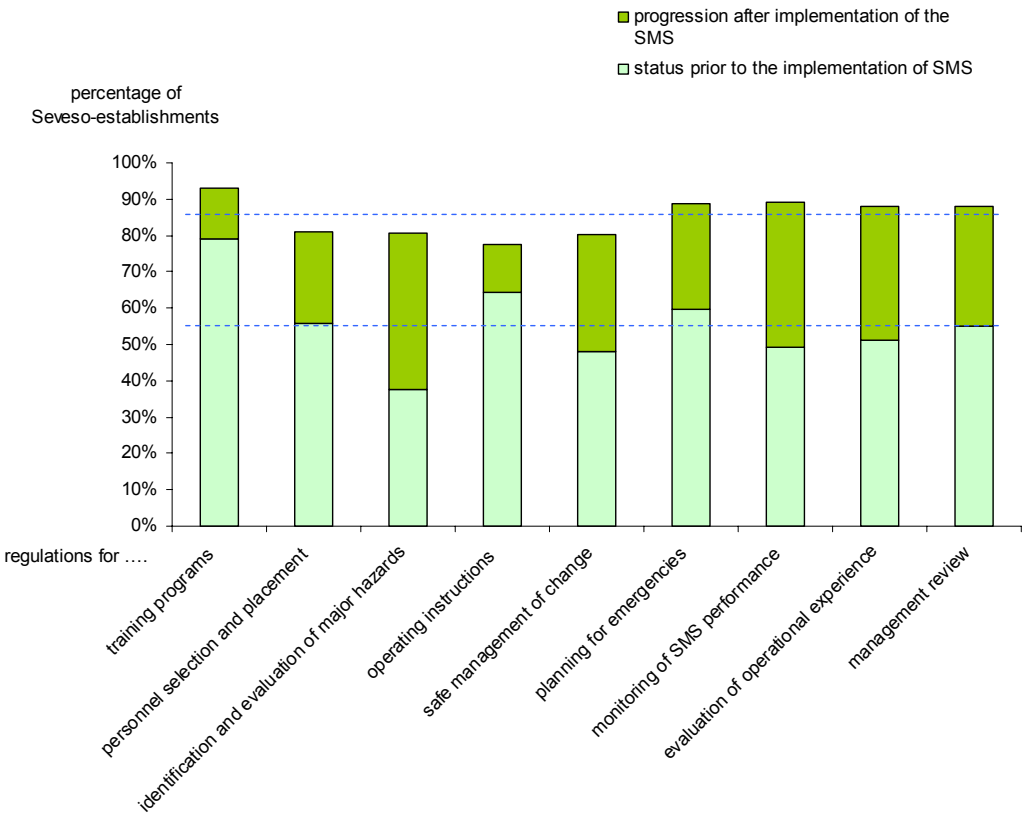
Question 7.1 Regulations for management review

The findings concerning these questions are presented here in summary. In the course of the evaluation the detailed subjects refer to this description where required.

- Availability of written regulations.

  The implementation of the SMS caused a clear increase of written regulations for individual parts of the SMS of 30 % on average. The level of regulations on average rose from 55 % prior to the implementation of the SMS to currently 85 %.

Figure 5.0-6: Availability of Written Regulations (Summary)

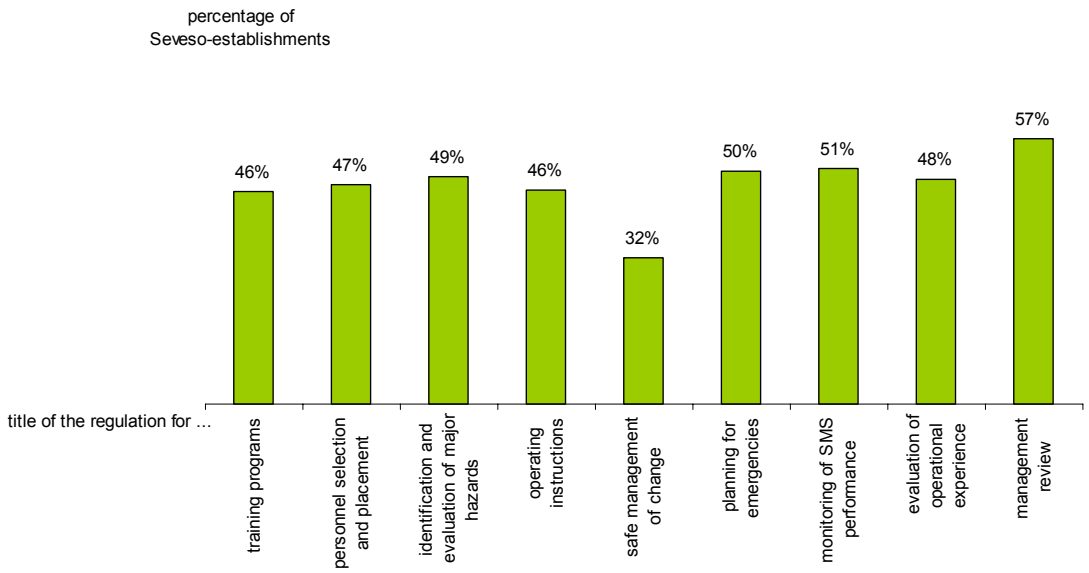


The general trend indicates that the SMS is implemented consistently. About that written regulations are an essential base for the SMS. The increase of written regulations means a positive progression, because they ensure a consistent and transparent proceeding. So they improve the conditions for documentation, verification management and evaluation, as well as for knowledge management. Thus they have a lasting effect on the further development of safety and on the optimisation of operational procedures.

- Information on the title of written regulations.

  47 % of the Seveso-establishments on an average for all subjects have given information on the title of written regulations. This value considers all entries irrespective of the kind of answering.

Figure 5.0-7: Information on the Title of Written Regulations (Summary)



However, there is a smaller percentage of answers which are really suitable in the context of the questioning:

- Only single Seveso-establishments have specified the real title or the number of regulations. Examples: „Schulungsbedarf und –planung / Nr. 2.1.1.1“, „VAW 4.0-03, Erstellung/ Änderung von Betriebsanweisungen“.
- A few Seveso-establishments have used general terms without a specific reference to the question. Example: „Unterweisung“, „Betriebsanweisung“, „Qualifizierungsplan“.
- Several Seveso-establishments have referred to manuals without further specification. Example: „QM-Handbuch“, „UMH“, „SMH“.

- Some Seveso-establishments have referred to the safety report („Sicherheitsbericht“) in general.

A reply was sent only by nearly half the Seveso-establishments, which had declared before having written regulations. This discrepancy might be traced back to the fact that specific regulations had been available but title or document number were not brought forward into the questionnaire. In case that no detailed regulations are existent the answers regarding the availability of written regulations should be analysed again.

Furthermore some of the Seveso-establishments have answered inaccurately. These entries are leading to the assumption that only higher-ranking or general documents were generated but detailed and executable instructions for specific applications are not provided. Such a constitution of operational regulations would not be in accordance with the requirements which have to be met by a management system. Specific regulations should be related to individual processes of the SMS. The remaining questions can not be answered based on the information as available. It is recommended to verify completeness and suitability (system, level of detail, applicability) of written regulations as well as to enhance it where appropriate.

5.1 Organisation and personnel

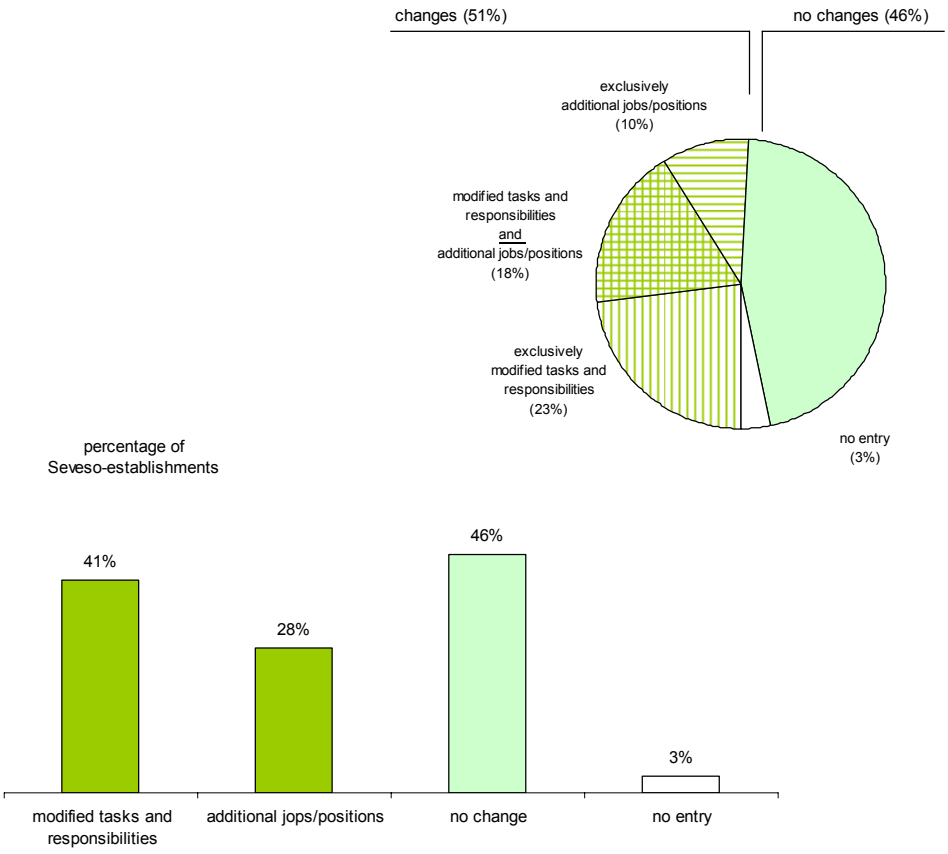
Question 1.1 What changes of the existing organisational structure resulted from the implementation of the SMS?

Changes of the organisational structure were required due to new or extended management tasks, due to implementation or extension of the commissioner system and due to additional requirements on documentation and training. Mainly it was realised by a modification of existing jobs and less by adding new jobs.

Referring to the total number of Seveso-establishments the implementation of the SMS caused changes for nearly half the Seveso-establishments. The other half required no changes of the organisational structure. It is illustrated that the SMS could be integrated widely in existing structures.

An evaluation according to the size of the establishments (number of employees) shows that for „minor“ Seveso-establishments a modification was required over average (see also: chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**, figure 5.0-4).

Figure 5.1-1: Changes of the organisational structure

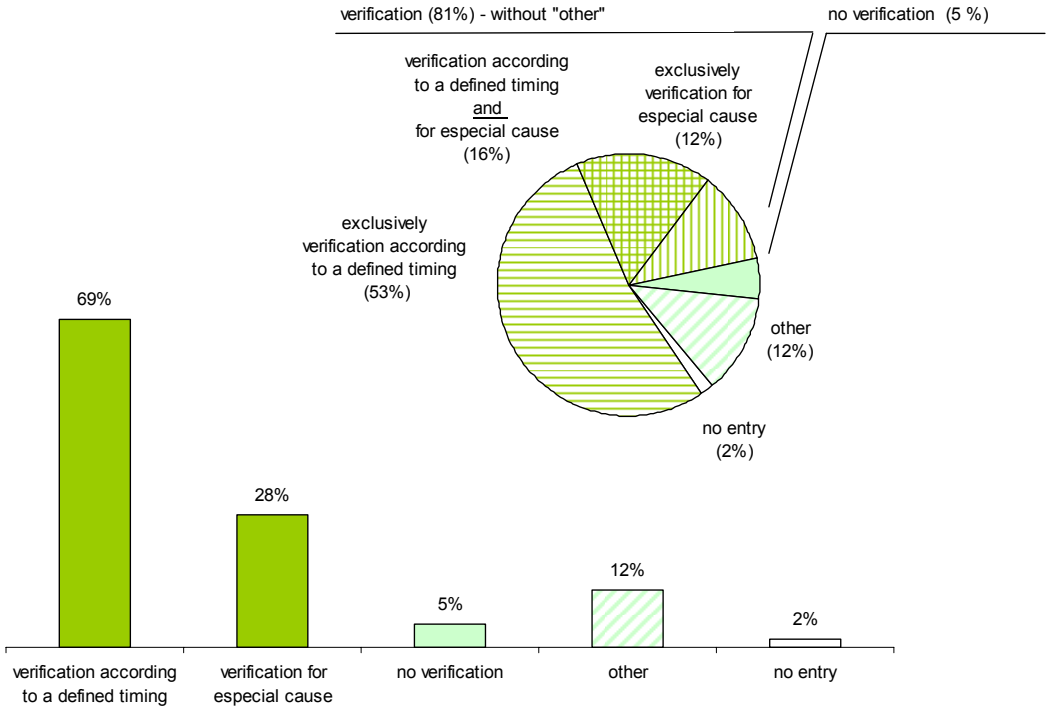


Question 1.2.1: Has the participation in training programs been verified since implementation of the SMS?

The participation in the training program is verified in more than 80 % of the Seveso-establishments. For the majority of the Seveso-plants (69 %) the verification is executed according to a defined timing and/or less for especial causes (28 %).

Only 5 % of the Seveso-establishments have stated explicitly „no verification“. In the context of „other“ (12 %) additional provisions are described (e. g. „ständige Überwachung“, „Stichproben“; „durch Führungskraft“), which may contribute to a verification. But it is in question whether these provisions are linked with a systematic proceeding. Thus a more detailed investigation might come to the result that this part (answering to “other”) means no systematic verification as intended in the SMS. The influence arising from that is not significant for the findings.

Figure 5.1-2: Verification of the participation in training programs



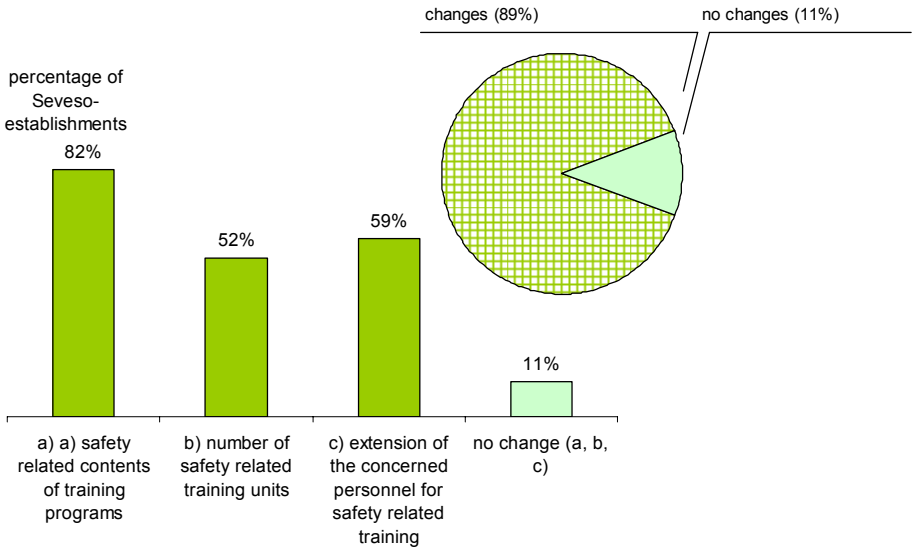
The overall view looks positively that for a high percentage of Seveso-establishments the realisation of training programs is ensured by an appropriate verification.

Question 1.2.2: Have the training programs been modified since the implementation of the SMS?

For 89 % of the Seveso-establishments the implementation of the SMS required changes of the training programs. Mostly it concerned (82 % of the Seveso-establishments) the modification of training program contents. But also the frequency of training units and the persons to be concerned were modified for more than half the Seveso-establishments. Due to the SMS specific personnel requirements were established, which had not been considered in the scope of the training programs before.

Arising from other parts of the evaluation there are references to interdependences and to specific training contents (e. g. operational control, planning for emergencies). Thereby the increasing demand for training (contents, frequency, concerned persons) as a general trend is confirmed in detail.

Figure 5.1-3: Change of training programs (overall)



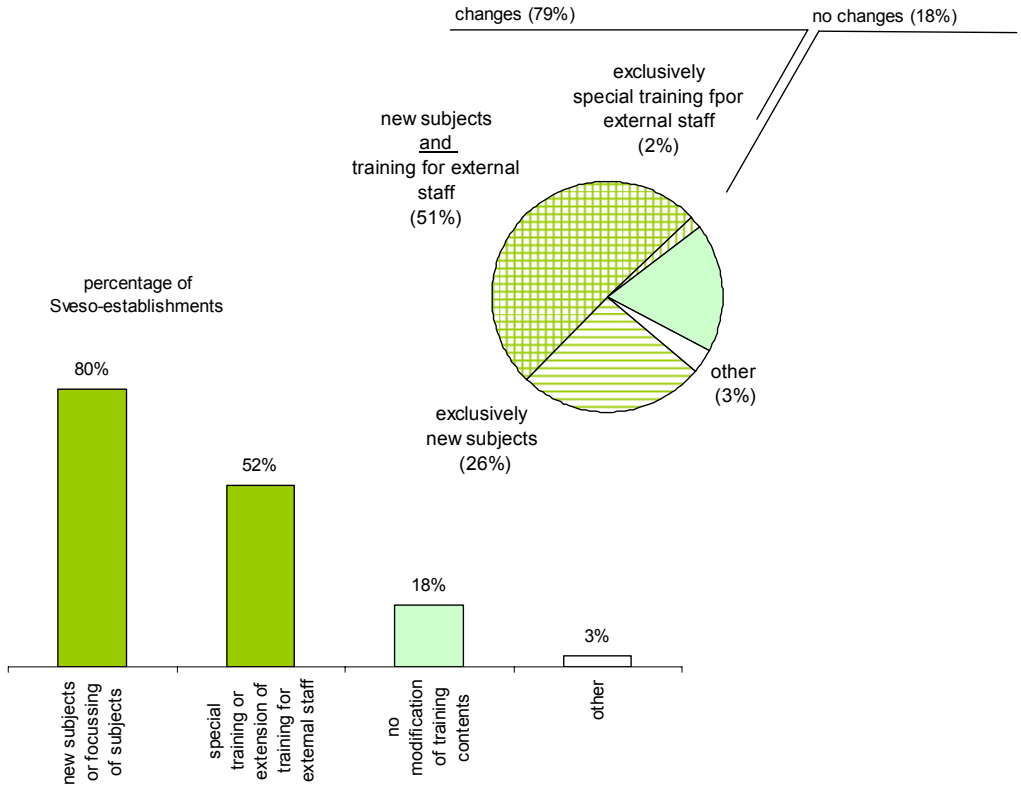
a) safety related contents of training programs

The subjects which have been established as parts of the SMS are considered by the adjustment of training contents. For nearly half the Seveso-establishments (52 %) a reorientation regarding the personnel to be concerned can be seen by involving especially external staff.

The main topics refer to training for hazards and actions in case of accidents. An additional demand for training existed regarding the organisational conditions for the SMS (commissioners, management tasks, auditing).

In the context of „other“ it is mentioned that the training contents are adjusted also due to a modified regulation framework, i. e. not all requirements on training programs are arising from the SMS. However, a high percentage of Seveso-establishments has modified training programs as a consequence of the implementation of the SMS. The specific input of the SMS is related to the fact that within the SMS the demand for education and training has to be determined for the personnel on all organisational levels involved in the prevention of accidents and the mitigation of their consequences. This approach is transcending the training regarding only individual persons and tasks.

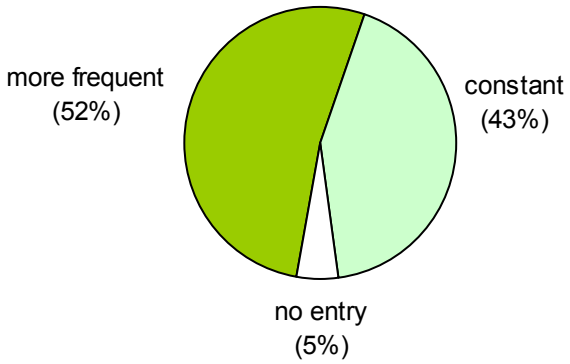
Figure 5.1-4: Change of training program contents



b) number of safety related training units

Due to the extension of training contents (see above) the existing training cycle could not be realised furthermore. An increased number of training units was required for nearly half the Seveso-establishments (52 %). A decreasing number is indicated for none of the Seveso-establishments. Thus no clear trend has resulted.

Figure 5.1-5: Change of frequency of safety related training



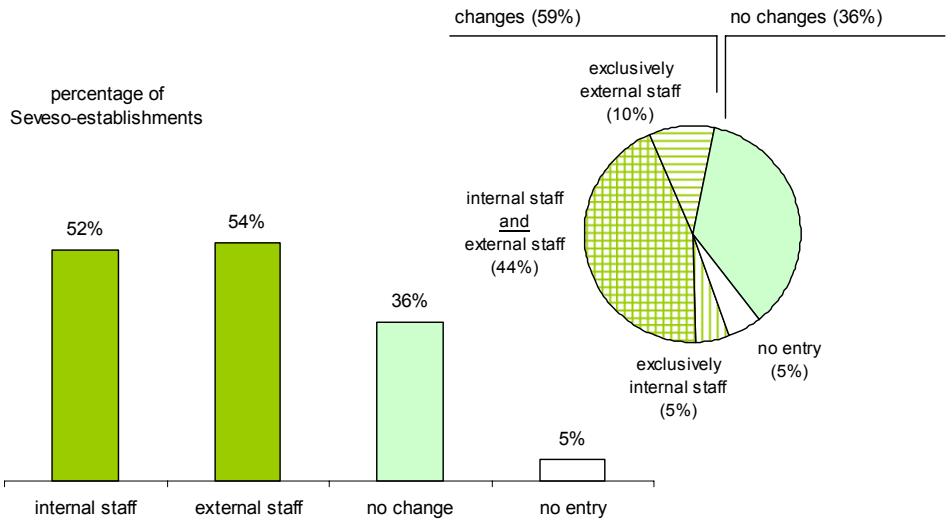
c) extension of the concerned personnel for safety related training

The personnel to be concerned in the training were extended for 59 % of the Seveso-establishments. The changes referred similarly to internal staff (52 %) and to external staff (54 %). In Seveso-establishments involving additional persons or organisational units normally (more than 80 % of these Seveso-establishments) both groups (internal and external staff) were considered.

The changes as indicated for internal and for external staff resulted from different effects: The German Hazardous Incident Ordinance (appendix III, No 3a) requires in detail the consideration of external staff. For many Seveso-establishments this requirement resulted in a corresponding extension of the personnel to be concerned in training programs but also in a reorganisation of the training contents (see above, specific training for external staff). Thus it is substantiated that the special demand for training regarding external staff was identified and implemented.

The consideration of additional internal staff is a consequence of a systematic determination of the demand for training within the SMS covering all organisational levels. This may be more likely connected with limited extensions.

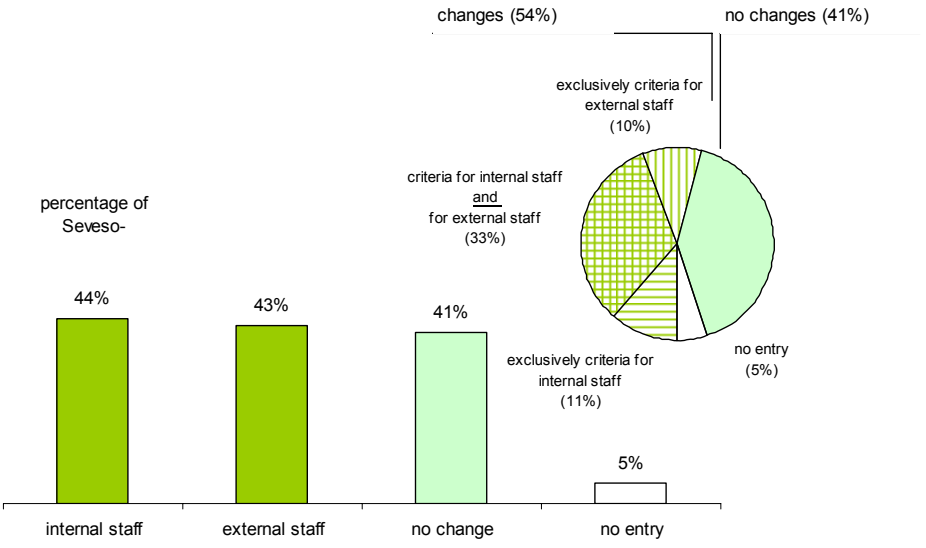
Figure 5.1-6: Change of the personnel to be concerned in safety related training



Question 1.3.1 Have the criteria for selection and placement of personnel been changed since the implementation of SMS?

Since the implementation of the SMS nearly half the Seveso-establishments (54 %) have changed the criteria for personnel selection and personnel placement.

Figure 5.1-7: Change of the criteria for personnel selection and personnel placement



The intensified consideration of safety related competences is of similar importance for internal staff and for external staff (44 % and 43 % of the Seveso-establishments). If changes were needed, by the majority (relative frequency 84 %) it was carried out for internal staff as well as for external staff, too.

A rather important percentage of Seveso-establishments required no changes. It can be seen in the explanations that safety related competences for personnel selection and personnel placement had been considered even prior to the implementation of the SMS. Moreover, it is referred to specific requirements arising from the regulation framework (e. g. TRBS, WHG). Thus the implementation of the SMS is not the exclusive reason for the consideration of safety related competences for the personnel selection. However, the implementation of the SMS has contributed to a considerable increase of the importance of safety related aspects for personnel decisions.

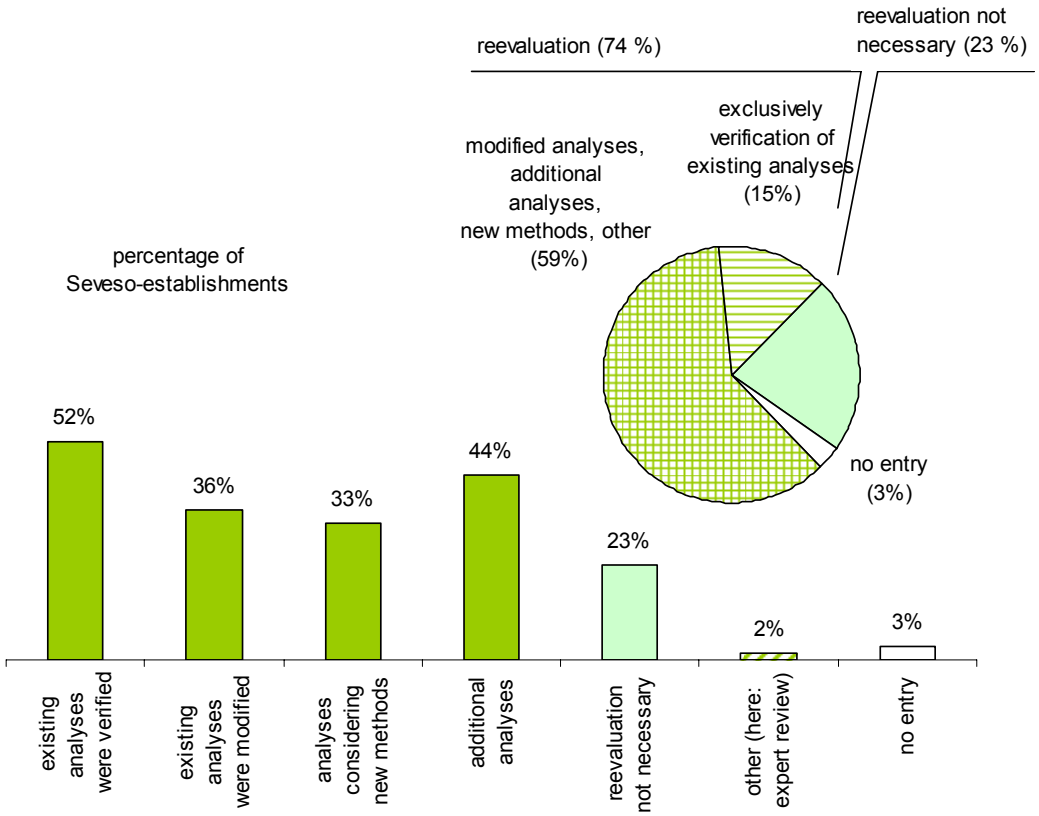
5.2 Identification and evaluation of major hazards

Question 2.1.1: Has a re-evaluation of major hazards been performed since the implementation of the SMS?

Measures to re-evaluate major hazards were taken for about three quarters (74 %) of the Seveso-establishments. Modified or additional analyses were required for 59 % of the Seveso-establishments. The modification of existing analyses, analyses based on new methods as well as additional analyses reached significant percentages with similar dimensions.

Existing analyses were verified for nearly half the Seveso-establishments. The verification widely was combined with changes of analyses (scope, methods). Only on a small extent (15 % of the Seveso-establishments) the verification resulted not in further measures. An extension of the scope of analyses resulted especially from the consideration of additional accident scenarios (e. g. fire, major accidents). Referring to the question on methodical changes the application of standardised proceedings for the hazard assessment (PAAG/HAZOP, FMEA, etc.) is mentioned. It is arising from the explanations that the re-evaluation is in a close context with the creation or revision of the safety report, which requires a presentation of the results of the major hazards analyses independently.

Figure 5.2-1: Re-evaluation of major hazards



The SMS requires a systematic verification of the major hazards analyses. Due to this to a large extend the demand was identified for updates and extensions. The establishing of binding regulations related to this subject within the SMS is of great importance. For the single elements of SMS the level of written regulations has increased by 30 % on average but the “Identification and Evaluation of Major Hazards” holds the maximum increase of 43 % (see chapter 5.0.2). This enables the conclusion that only on the written regulations within the SMS a sufficient scope of major hazards analyses can be ensured.

5.3 Operational control

Question 3.1.1: Effects on working and operating instructions by the implementation of SMS?

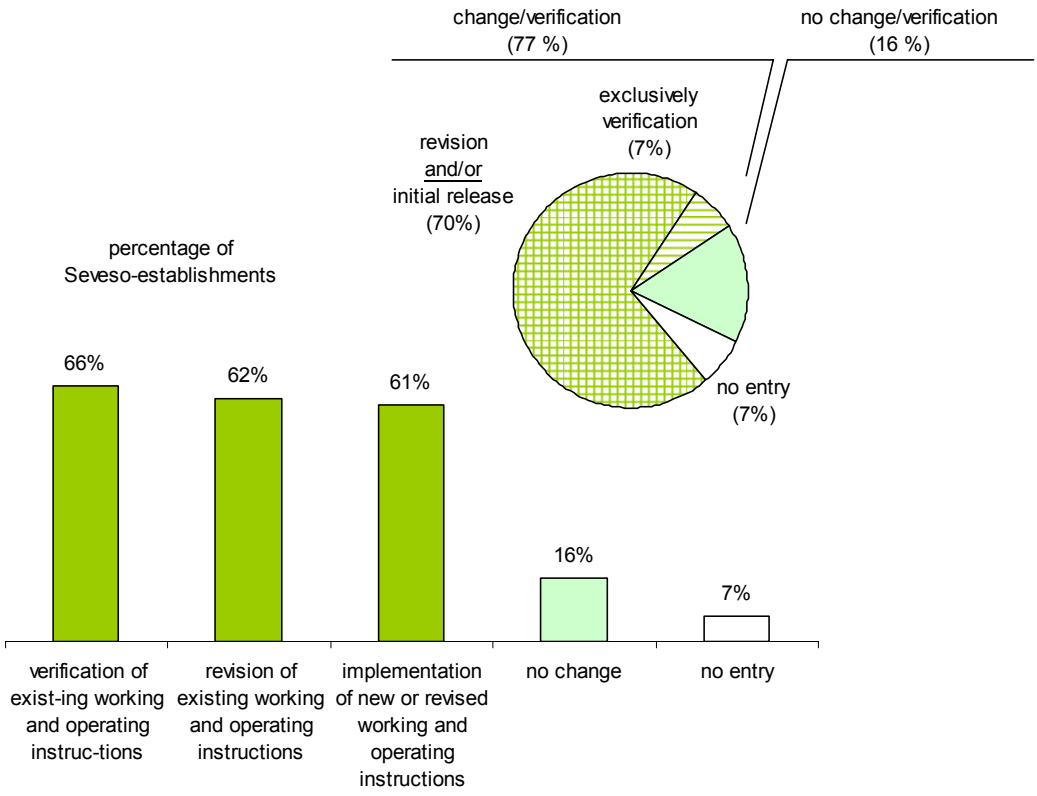
a) What changes were caused by the implementation of the SMS?

The implementation of the SMS caused changes of working and operating instructions for 77 % of the Seveso-establishments. The verification of existing instructions, the revision of existing instructions and the initial release of new

instructions give approximately equivalent results, each of them relevant for more than 60 % of the Seveso-establishments.

For nearly half the Seveso-establishments (46 %) verifications as well as initial releases were executed. The verification widely resulted in changes. Only on a very small extend (7 %) the verification did not cause further measures.

Figure 5.3-1: Change of operating and working instructions



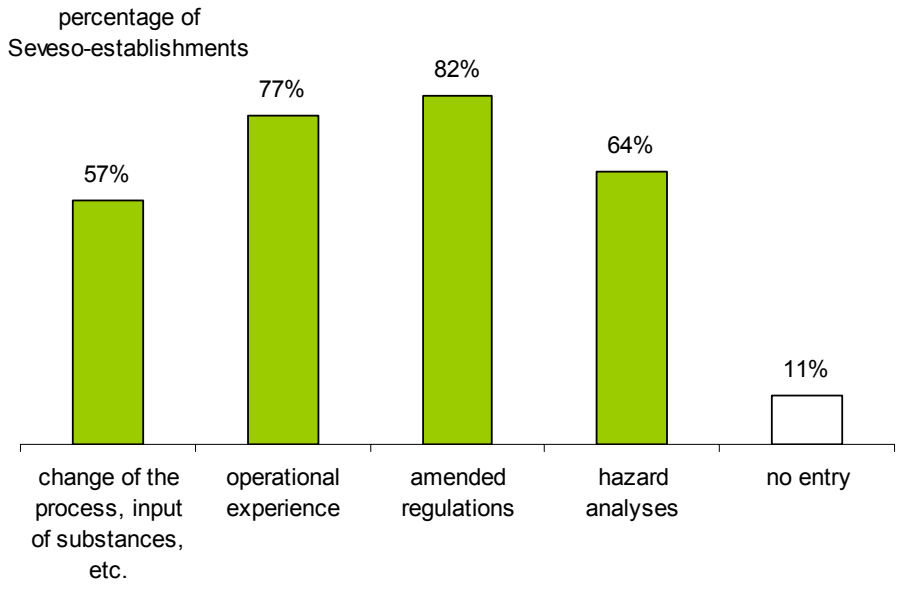
Additional explanations indicated that requirements on the verification and revision of existing working and operating instructions are given also beside the SMS (e. g. certification, external regulation). Due to the SMS only a rather small increase of regulations regarding the verification and revision of working and operating instructions was caused (see chapter 5.0.2). Hence it is remarkable that as a consequence of the verification even an important demand for changes resulted concerning working and operating instructions.

The SMS is connected with specific aspects which had not been considered in the procedures so far and which required an appropriate adaption of instructions. Furthermore in the scope of the SMS interrelations are identified requiring additional working and operating instructions. These interrelations can not be identified by viewing isolated at single procedures.

b) What was the reason for the modification of working and operating instructions?

The revision or the initial release of working and operating instructions most frequently (82 % of the Seveso-establishments) resulted from regulations that had been modified. Prevailing external requirements (e. g. authorities, regulation framework) belong to this category.

Figure 5.3-2: Reasons for the modification of working and operating instructions



Otherwise, in the context of the answering specific interrelations with other SMS processes can be seen clearly. As illustrated by the distribution of the answering dominant internal reasons arise[5] from the evaluation of operational experience (77 %), changes (57 %) and hazard analyses (64 %). Thus it is confirmed to consider these aspects systematically in the SMS.

5.4 Safe management of changes

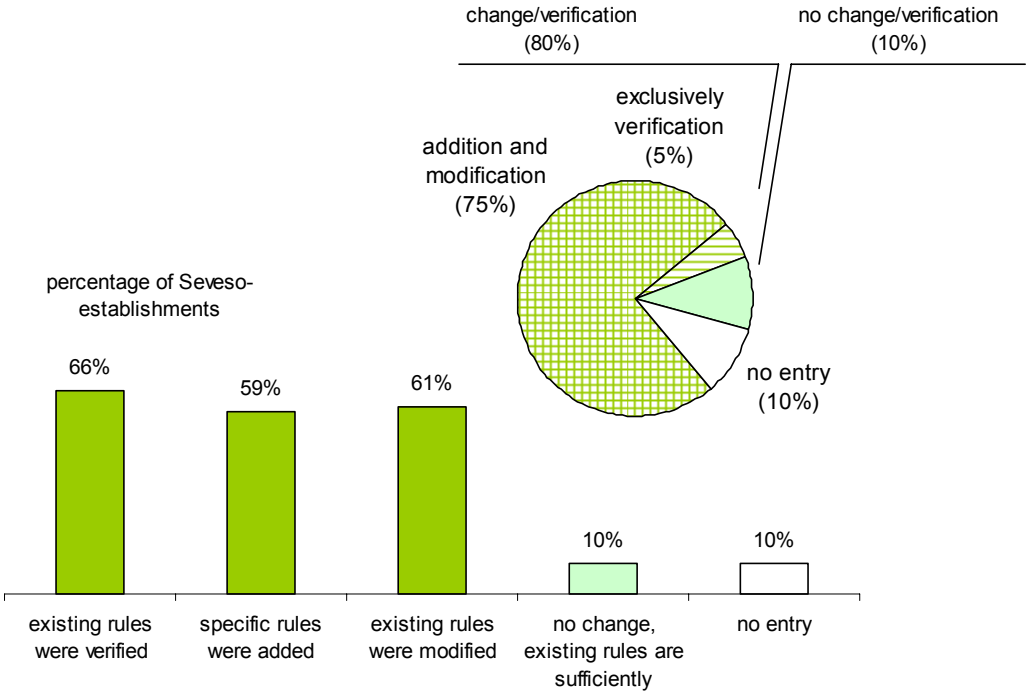
Question 4.1.1: What changes resulted from the implementation of the SMS?

a) Revision of rules for the management of changes.

Due to the implementation of the SMS rules for the „Safe Management of Changes“ were verified and/or modified for 80 % of the Seveso-establishments.

[5] „other“ covers additional explanations but no different kind of reasons for the modification of working and operating instructions. Thus the entries related to “other” are not considered quantitatively

Figure 5.4-1: Review of rules for the management of change



The verification of existing rules (66 %), the addition of specific rules (59 %), as well as the modification of existing rules (61 %) were of similar quantitative importance und were normally combined. They were not of importance as individual measures. It is explained that the modification and the initial release were based on existing procedures. Apparently they were not provided as defined processes in the management system. The increase of written regulations refers to this. Specific impacts of the SMS are given regarding the concretion and documentation of the proceeding. Analogies can be seen to the subject “Operational Control” for which modifications of working and operating instruction were demonstrated on a similar extend.

b) How have the personnel been instructed after the realisation of changes regarding the consequences of the changes?

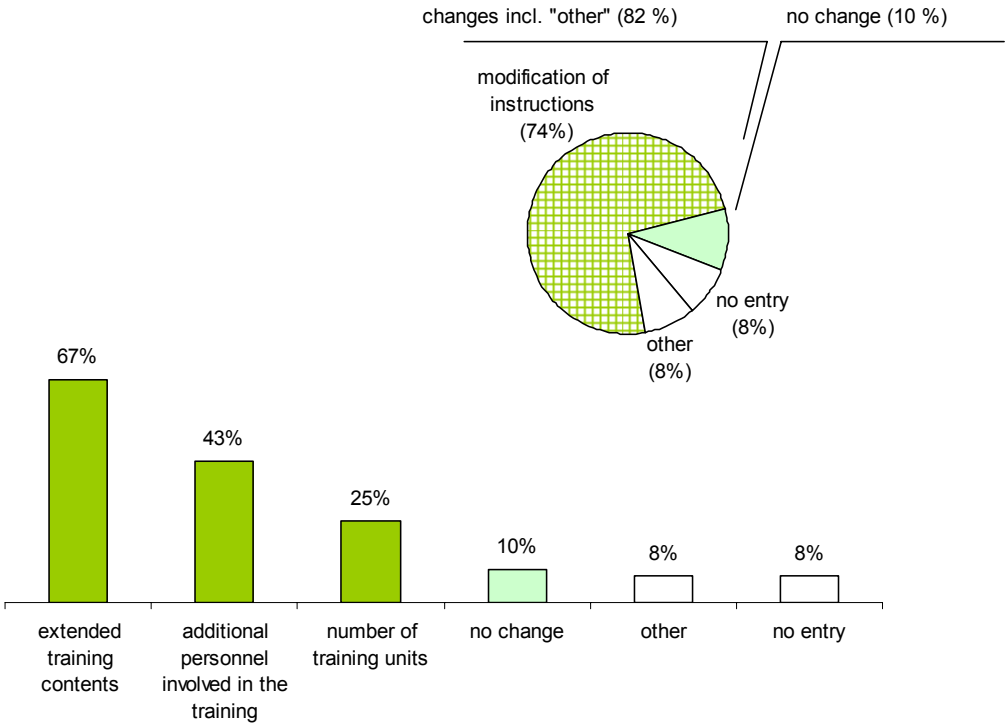
Personnel instructions to be performed in consequence of changes were modified for 82 % of the Seveso-establishments. This value is equivalent to the percentage of Seveso-establishments that had verified or modified rules for changes (see question 4.1.1 a). The information on working and operating instruction is an essential topic of the training.

The adaption of the instructions mainly was realised by extension of training contents (67 %) and/or by extension of persons to be concerned (43 %) and/or

by more frequent training (25 %). The in general high demand for the review of working and operating instructions is confirmed here (see chapter 5.1).

In the context of „other“ references are given to contents and proceedings (e. g. „gemeinsame Erarbeitung der Änderung“, „neue Regelungen und Schulung“, „neue Verfahrensfließbilder“, „Unterweisung durch … mit schriftlicher Dokumentation“). These entries could be considered as extensions with regard to contents and attached to the correspondent category of the questionnaire.

Figure 5.4-2: Instructions in consequence of the realisation of changes



The results as presented in chapter 5.1 regarding working and operating instructions in general (demand for changes, order of the results) are confirmed here in the context of rules for the management of changes.

Question 4.2: What experience resulted from the implementation of rules for the safe management of changes?

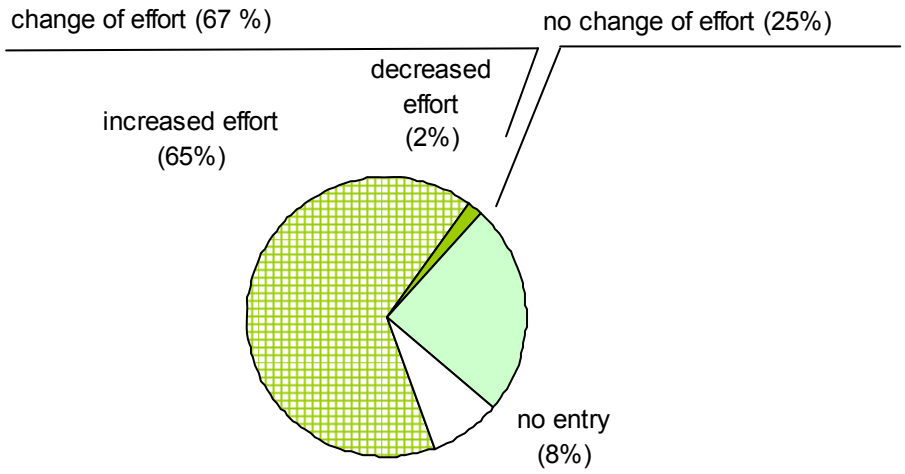
a) progression of effort (time, personnel) all in all for the realisation of changes

The requirements on the safe management of changes in the context of the SMS caused an increased effort for the realisation of changes for 65 % in the Seveso-establishments.

The increased effort is substantiated with additional control, documentation and training as well as more systematic proceeding and extended scope (changes to be considered). The results are not consistent, because at the same time a remarkable percentage (25 %) of the Seveso-establishments did not notice any change of the effort. For these Seveso-establishments the constant effort can not be reduced to the fact that no changes were performed. Mainly it is about Seveso-establishments (75 % of the cases) which have revised the rules for changes after the implementation of the SMS.

The increased effort for the management of changes for many Seveso-establishments is only one aspect. The systematic regulation in the context of the SMS also contributes to a higher efficiency and causes a progression of effort in the opposite direction.

Figure 5.4-3: Progression of the effort for the management of change



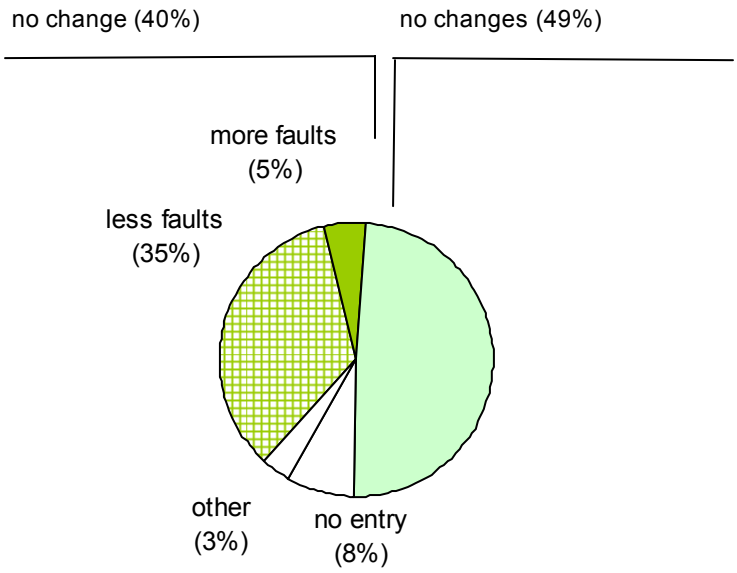
Single Seveso-establishments (2 %) have noticed a decreasing effort. To this no explanations are available, so the coherence with the SMS can not be estimated. The small extend of these answers is not of importance regarding the total view.

b) trend: number of faults occurring as a consequence of changes

Nearly half the Seveso-establishments (49 %) have detected not any variation of the number of faults occurring as a consequence of changes after the implementation of the SMS. Against it, more than one third of the Seveso-establishments (35 %) have noticed a decreasing trend. This is an indication on the success of the establishment of regulations related to the safe management of changes in the context of the SMS. Positive effects are resulting from an increasing sensitivity regarding safety related issues. It is insofar of overall importance for the SMS.

In the context of “other” single Seveso-establishments refer to their insufficient experience regarding this problem, so they have to wait for the further development.

Figure 5.4-4: Number of faults occurring in consequence of changes



A few Seveso-establishments (5 %) have noticed an increasing number of faults. “Qualified controls” is given as one reason. Thus the systematic consideration of changes within the SMS contributes to the identification of faults in consequence of changes that have been incorrectly planned or realised before. By control measures accompanying the realisation of changes faults can be detected in time, before they may result in more serious consequences. Otherwise, it can be assumed that prior to the implementation of the SMS, possibly there might have been a higher number of latent faults, in case a con-

trol system was implemented or developed only with the SMS. Insofar the trend “no changes” as indicated might have been influenced by an inadequate determination of faults.

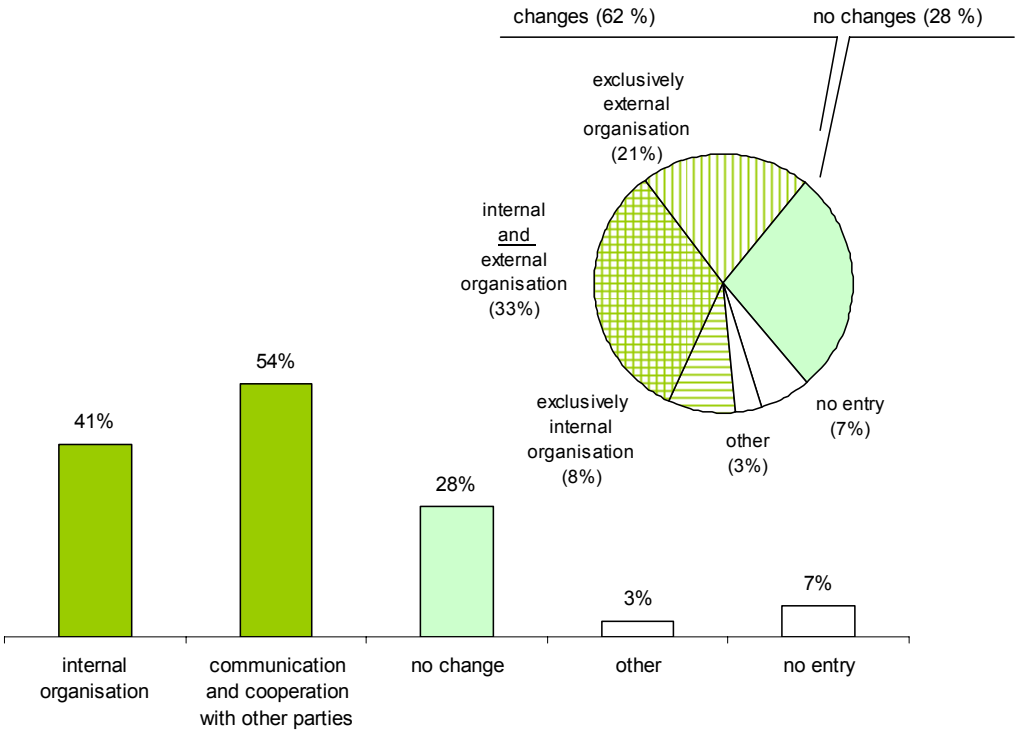
5.5 Planning for emergencies

Question 5.1.1 What changes resulted from the implementation of the SMS?

a) emergency organisation

The implementation of the SMS resulted for 62 % of the Seveso-establishments in changing the emergency organisation. Changes were performed regarding the external emergency organisation (communication and cooperation with other parties, 54 %) as well as regarding the internal emergency organisation (organisational structure, 41 %). For 33 % of the Seveso-establishments changes were necessary regarding both categories.

Figure 5.5-1: Change of the emergency organisation



The internal organisational structure primarily was adjusted by defining and allocating tasks. External changes covered an enhanced consideration of the concerned authorities and of the neighbourhood (resident, companies). The entries in the context of “other” are not explained.

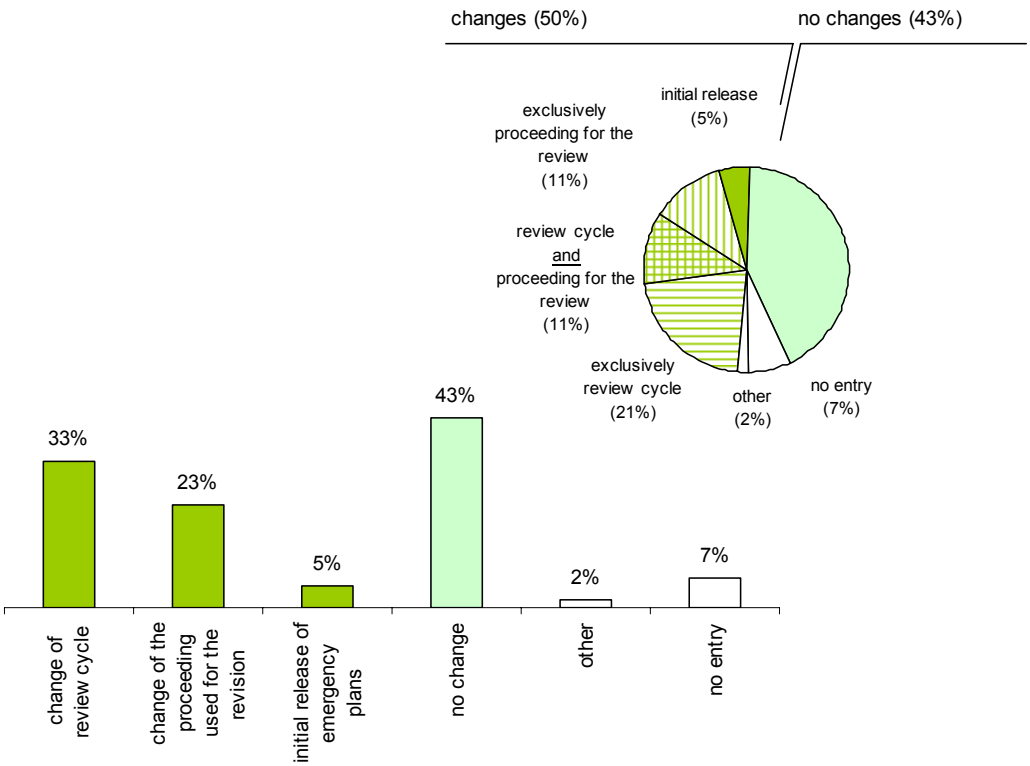
The implementation of the SMS caused changes of the emergency organisation which all in all (internal and external) were more extensive than the impact on the general organisation (see chapter 5.1). Comparatively, the specific requirements arising from the planning for emergencies could be integrated into the existing organisational structure only suboptimal.

The SMS is of especial importance for the development of the emergency organisation. The highest demand existed for the external emergency organisation. This can be explained due to the organisation primarily had been oriented to internal procedures before. In consequence of the implementation of the planning for emergencies external interactions have to be considered to a greater extend.

b) Emergency Plans

Subsequently to the implementation of the SMS for half the Seveso-establishments emergency plans were modified. The modifications covered the review cycle (33 %) and/or to the review proceeding (23 %).

Figure 5.5-2: Change of the emergency plans



The explanations indicate a more frequent, a more comprehensive and a more systematic verification, in parts also in the context of the review of the safety report.

„Other“ refers to Seveso-establishments which had to create emergency plans for the first time and which now are considered in a separate category (“initial release”: 5 %). This is about Seveso-establishments which are subject to the extended obligations of the German Hazardous Incident Ordinance.

An important percentage of the Seveso-establishments (43 %) required no changes. To this no explanations are available.

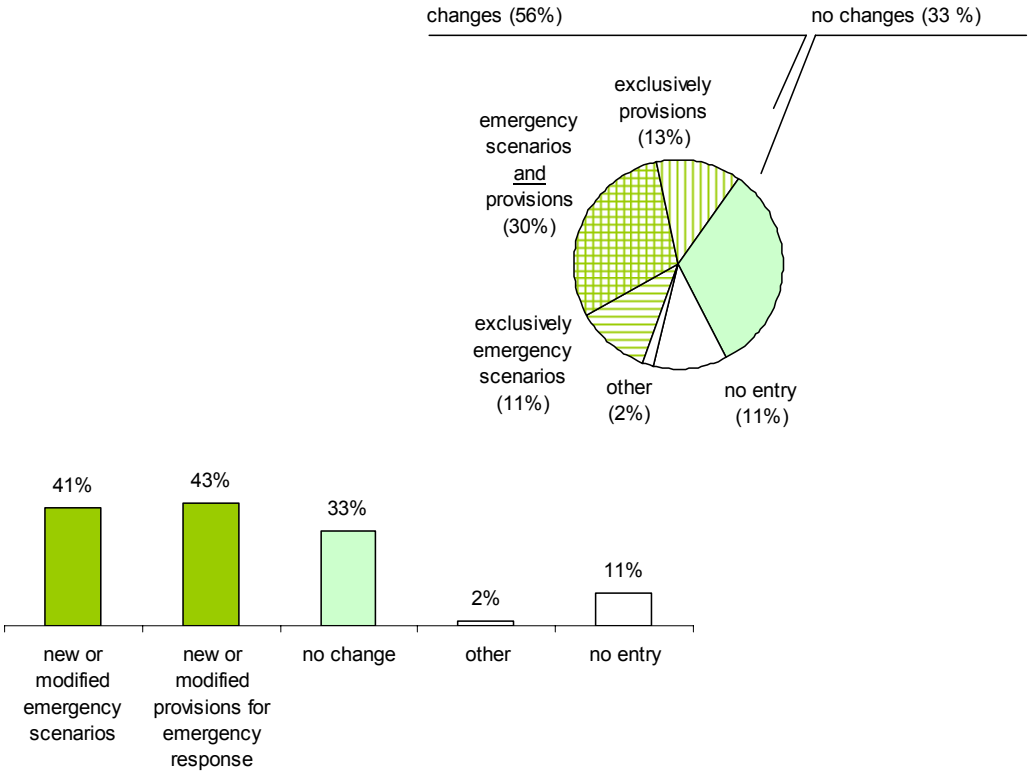
It can be concluded from the answering that only for a few Seveso-establishments changes with regard to contents of the emergency plans were necessary. The specific impact of the SMS aims at formal aspects of the review. This can be explained by the clear increase of regulations related to this subject in the context of the SMS. More than 30 % of the Seveso-establishments have released written regulations related to emergency plans only after the implementation of the SMS.

c) emergency scenarios

Modifications were performed for 56 % of the Seveso-establishments. They referred on a similar extend to emergency scenarios (41 %) and to emergency response provisions (43 %).

Single examples for extensions with regard to contents of emergency scenarios are given but they are not allowing for a general conclusion. Repeatedly it is referred to the interrelation with the emergency plan as well as the updating of the safety report. The need is confirmed to bring the activities together inside the SMS.

Figure 5.5-3: Change of emergency scenarios

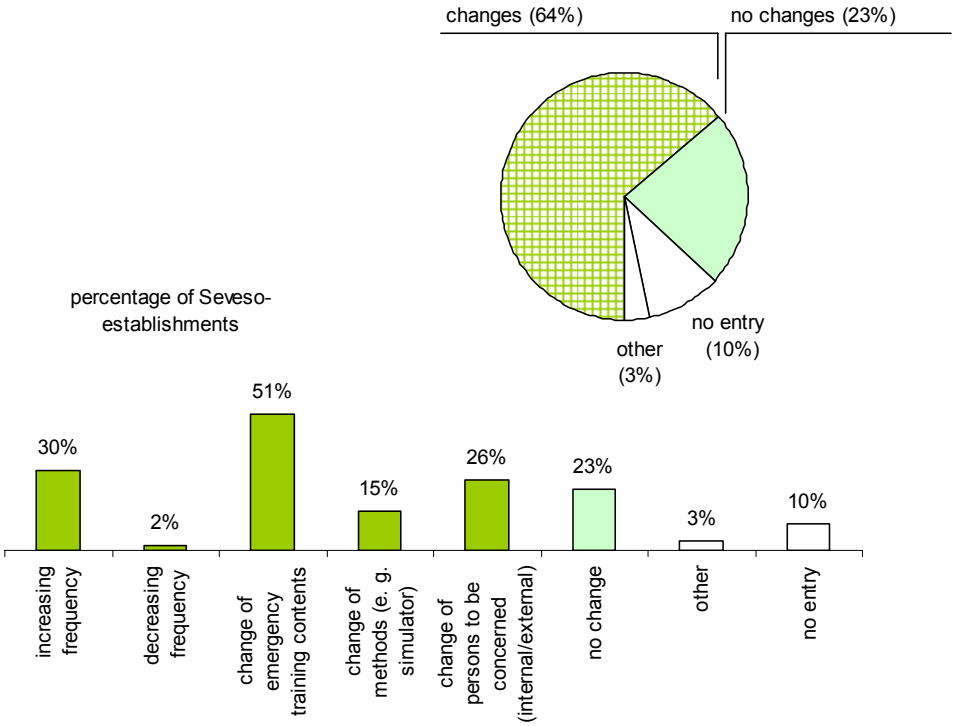


d) emergency training

64 % of the Seveso-establishments revised the emergency training. The change of training contents (51 %), the change of frequency (30 %) and the change of concerned persons (26 %) provided the greatest values. These factors (contents, frequency, concerned persons) were of special importance in a same order for the change of training programs in general (see chapter 5.1).

The changes of emergency training are a consequence of other changes in the field of the planning for emergencies (emergency organisation, emergency plan, emergency scenarios) as described before, which are of similar dimension.

Figure 5.5-4: Changes of emergency training



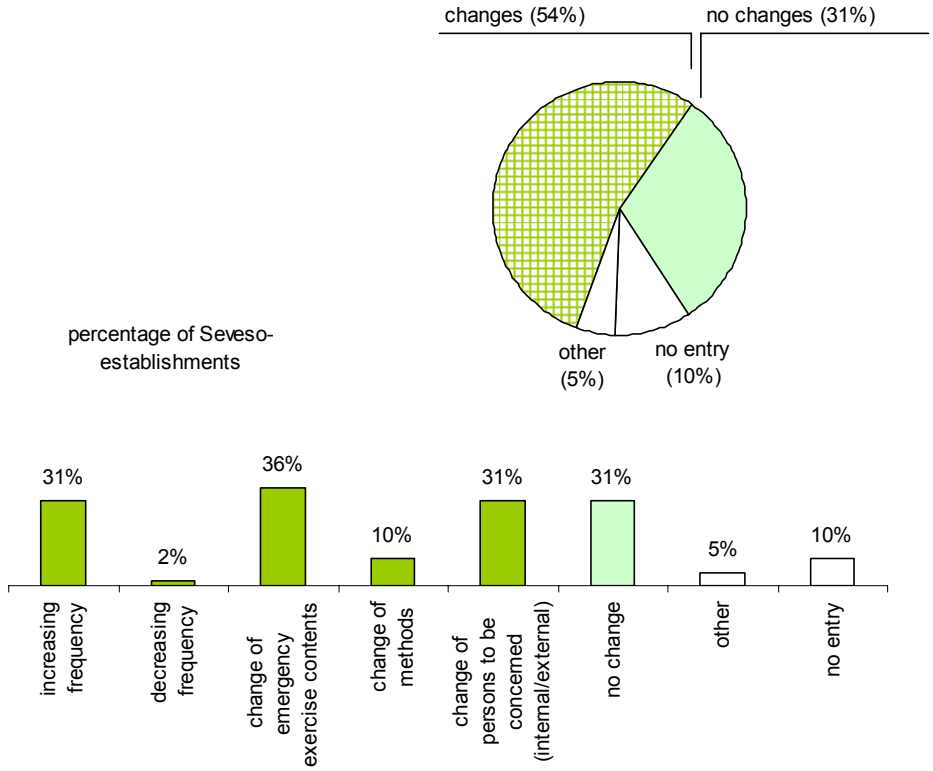
e) emergency exercise

Nearly half the Seveso-establishments (54 %) have changed the emergency exercises. Variations of contents, frequency and persons to be concerned in emergency exercises were approximately of the same importance.

The substantial causes for changes regarding contents and frequency of emergency exercises have resulted from the following interrelation: for more than 90 % of the Seveso-establishments, which had changed the emergency organisation or the emergency scenarios, subsequently the emergency exercises were adapted.

The variation of participants in emergency exercises is interdependent with the changes of the emergency organisation. An intensified orientation to external interrelations could be seen (communication, cooperation with other parties). Possibly it caused retroactive effects on the planning for emergency exercises.

Figure 5.5-5: Changes of emergency exercises



5.6 Monitoring of SMS peformance

Question 6.1.1 For what processes measures have been deviated from the monitoring of SMS Performance?

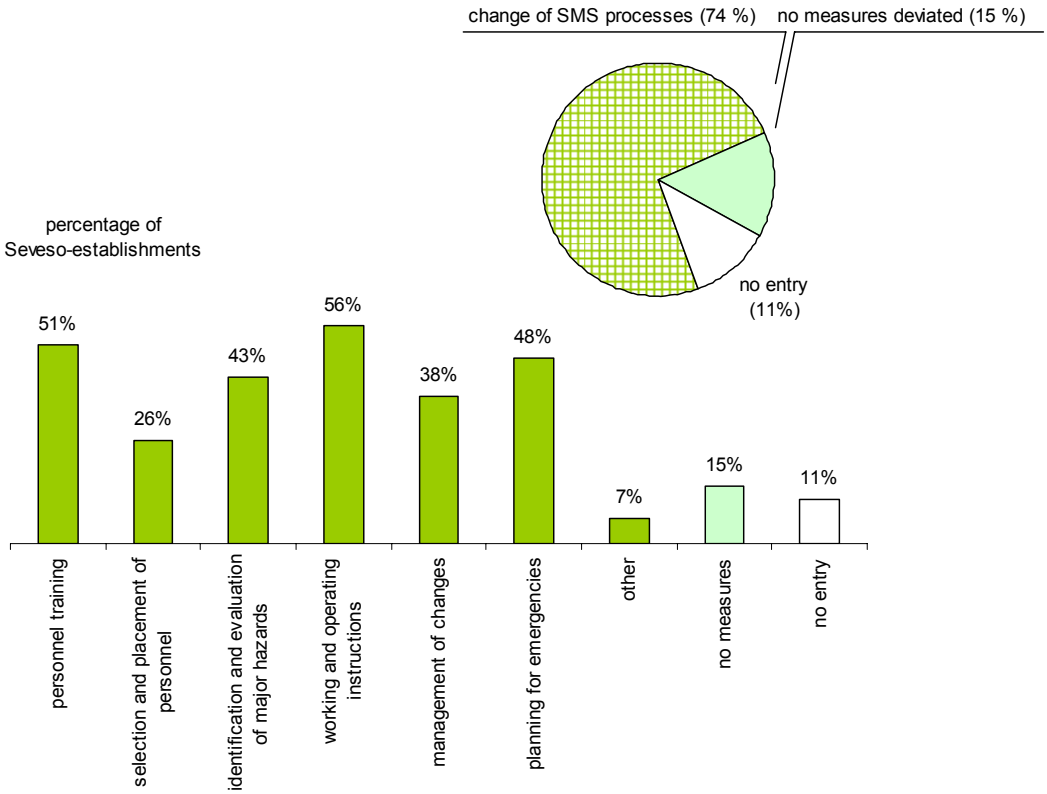
Arising from the monitoring of SMS performance all in all 74 % of the Seveso-establishments have deviated a changing of safety related processes. The monitoring of SMS performance is widely implemented in the Seveso-establishments and is resulting in relevant findings. The dimension of changing illustrates that the SMS processes are not statically fixed but requiring a dynamic adjustment.

Several Seveso-establishments have used the expression “continuous improvement process”. Because no further explanations are added, it remains as a question, to which extends a systematic and defined process within the SMS is associated.

A prominent focus of answers can not be seen. Changes were deviated for all the processes, most frequently related to working and operating instructions (56 %), personnel training (51 %) and planning for emergencies (48 %). The demand for changes is confirmed qualitatively by the results arising from the preceding chapters, which had asked for changes due to the implementation of the SMS as well.

The percentage of changes in Seveso-establishments as shown here is less than described for individual subjects in the previous sections. This can be attributed to the fact that the monitoring of the SMS performance only reflects the results arising from the audits which have been performed in this context. The previous questions also cover changes due to other reasons (e. g. deficiencies, incidents, licensing requirements, regulation framework). Seveso-establishments, which have deviated changes for safety related processes, as a rule have adapted several processes (relative frequency > 90 %). The monitoring of SMS Performance is of importance for all individual processes as well as for their interactions.

Figure 5.6-1: Changes of SMS processes arising from the monitoring of SMS performance



In the context of „other“ a few Seveso-establishments (4 %) have explained that findings are not available because the monitoring was not yet initiated. Currently these answers are assigned to the category “no measures” but the further progression remains to be seen. Beside this there are several answers in the context of “other” which can be interpreted as independent measures.

Apart from that, changes have resulted irrespectively of the date the SMS was implemented, also in Seveso-establishments the monitoring was performed repeatedly

or rather for many years. All in all the results illustrate that the monitoring of SMS performance is an important and efficient element of the management system. From this a remarkable return of findings is arising referring to the evaluation and optimisation of the SMS processes. A continuous monitoring contributes to the fact that adverse trends may be detected in time, before safety related defects or incidents would occur.

Question 6.2.1 Progression after the implementation of the SMS

a) number of reported deviations (events, incidents, disturbances)

Only 37 % of the completed questionnaires have indicated data referring to reported deviations. The representativeness of the answering can not be estimated here. Normally no reason was given in case that no entry was made. Only for one single case it is confirmed that no relevant incidents have occurred over the specified period. In a few other cases findings are not yet available due to the system was implemented recently.

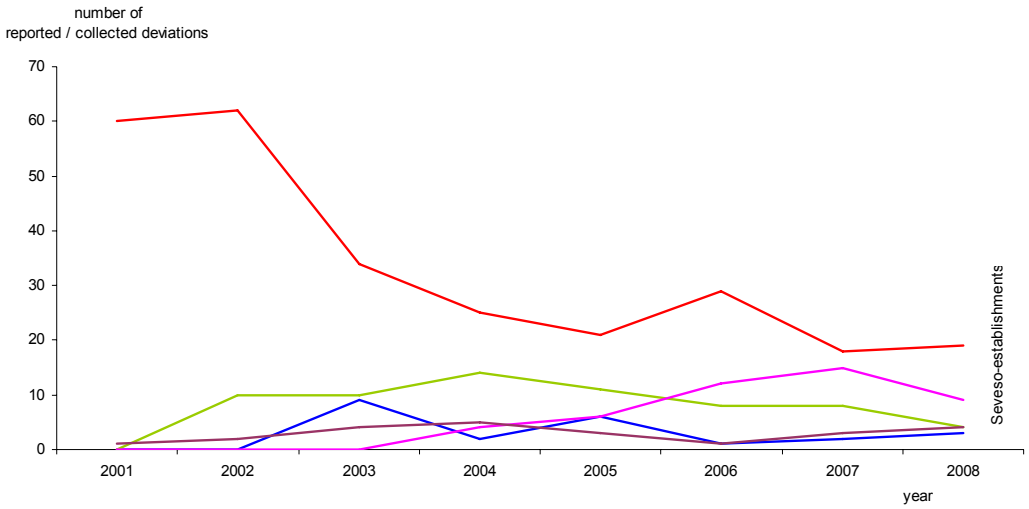
<u>total number of reported deviations</u>

The total number of reported deviations is between 0 and 62 per Seveso-establishment and per annum. The broad spread indicates that obviously different criteria for the selection of data were used, and due to that the results of single Seveso-establishments are incompatible with each other. A more comprehensive evaluation considering all Seveso-establishments is only possible with restrictions. In the following, the trend is discussed for individual Seveso-establishments. For this investigation Seveso-establishments are selected, which have reported a total number of ten deviations at a minimum over the given period, because effects of single events shall be excluded. Five Seveso-establishments remain, for which the trend of reported deviations is displayed as a set of curves in the following figure.

From the course of the curves no consistent trend of changes is arising. For the majority of the here selected Seveso-establishments the values remain constantly on a low level with small variations.

For the one Seveso-establishment, which has considered by far the greatest number of information, after the implementation of the SMS a clear decreasing trend can be seen. The remarkable differences are leading to the assumption that only for this Seveso-establishment operational experiences on a sufficient extend were collected and evaluated, so that only there the effects became apparent. This assumption can not further be investigated based on the information as given here.

Figure 5.6-2: Total number of reported deviations



The small number of reported information does not correlate with findings resulting from other parts of the questioning. Referring to the subject “safe management of changes” (question 4.2, chapter 5.4) for instance 35 % of the Seveso-establishments have indicated, that after the implementation of the SMS less deficiencies have occurred in consequence of the realisation of changes. Thus these deficiencies should have been collected by an internal reporting system. This is not reflected by the number of reported deviations as indicated according to question 6.2.1 (see table 4.6-1).

Against this background it is recommended to check the requirements on the evaluation of operational experience and their implementation. When indicated, it should be developed systematically, so that the relevant findings arising from the operational experience can be detected and can be utilised on a sufficient extend. Referring to this, unused capabilities are remaining obviously.

<u>safety related deviations</u>

The entries regarding safety related deviations are between 0 and 5 per Seveso-establishment and per annum. The incidents are punctual and distributed unsystematically. 82 % of the Seveso-establishments have reported not any safety related deviation over the total period. Only one Seveso-establishment indicates more than ten safety related deviations. A conclusion regarding the trend of safety related deviations can not be given based on the information as available.

b) What safety related measures were deviated from the evaluation of operational experience?

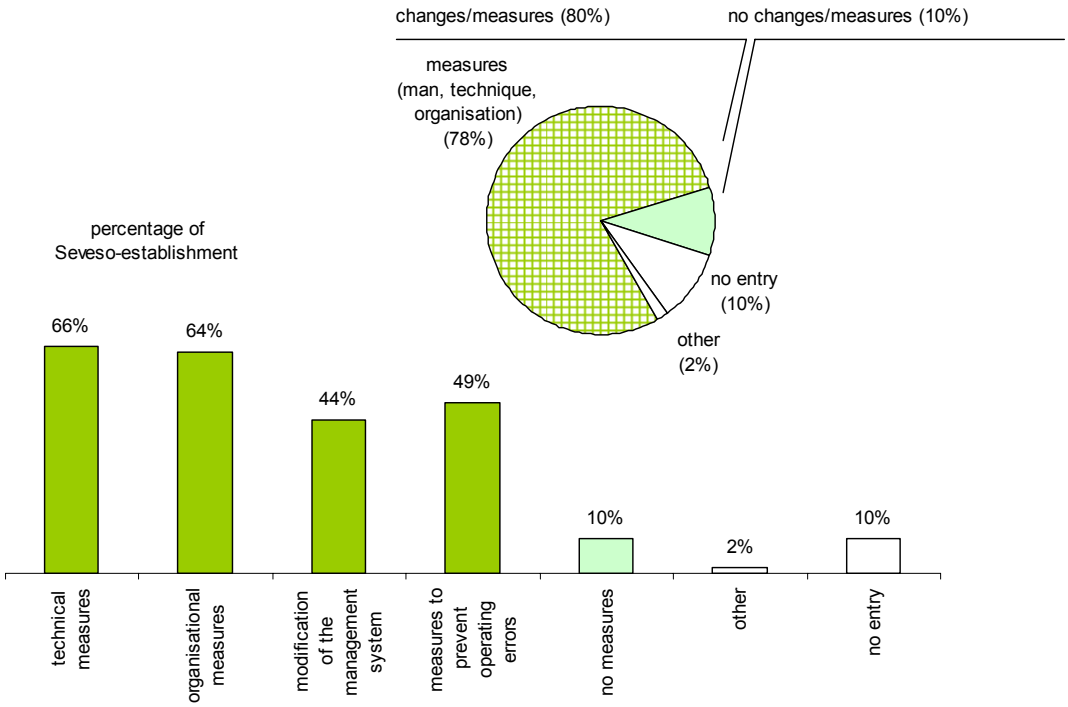
The predominant part of the Seveso-establishments (80 %) evaluates operational experience. Findings being of importance for the development of improvements are deviated.

Nearly on the same extend technical (66 %) and organisational (64 %) measures were indicated. The values regarding changes of the management system (44 %) and measures to prevent operating errors (49 %) are a little below.

More than 80 % (relative frequency) of the Seveso-establishments, which have deviated measures from the evaluation of operational experience, are doing this considering all aspects as named (man, technique, organisation/management).

Mostly a modification results in follow-up actions (e. g. technical changes require new operating instructions and training as well as the organisation of tasks). An isolated view (e. g. exclusively aimed at technical aspects) without any comprehensive understanding of the interrelations would not be appropriate.

Figure 5.6-3: Measures deviated from the evaluation of operational experience



The distribution of the answering illustrates that a systematic evaluation of operational experience results in findings referring to all contributing factors de-

riving from the sectors man, technique organisation/management. Furthermore it is confirmed that for the Seveso-establishments an integrated but not exclusively technique-oriented understanding of safety is widely implemented.

Examples of technical measures are related to individual equipment or modifications, and due to their small number they do not enable a general conclusion. Examples of organisational measures are review of documentation (instructions, manual), education and training. These measures enhance the completeness and the system of procedures as well as their documentation. They belong to the SMS directly. “Modification of the management system” and “organisational measures” are not interpreted consistently. An overlapping understanding of the contents can be seen. Thus a differentiated evaluation regarding both categories is not practicable.

5.7 Management review

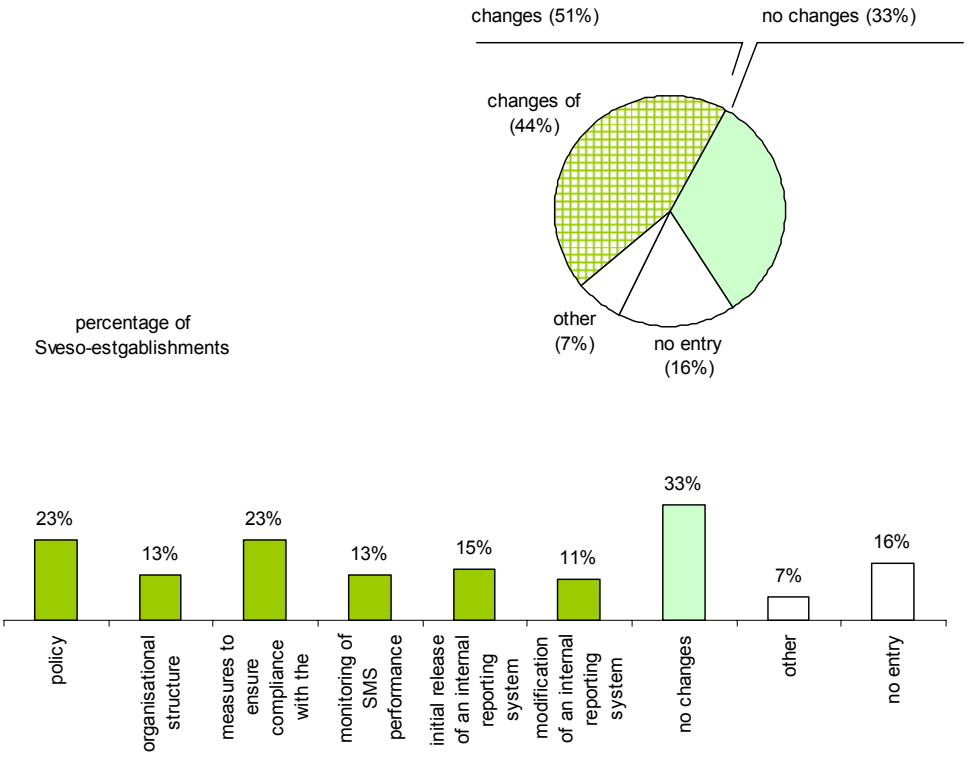
Question 7.1.1: What changes of the SMS were deviated from the management review?

Arising from the management review less than half the Seveso-establishments have deviated concrete changes within the SMS.

An important percentage of the Seveso-establishments (ca. one third, 33 %) have deviated not any measure. This value (“no change”) is clearly higher than those results referring to other subjects of the questioning. Also the percentage of Seveso-establishments which have provided no information is comparatively high. In the context of “other” several Seveso-establishments are considered for which findings are not available because they have not yet performed a management review. However, these Seveso-establishments are for about five years subject to the extended obligations of the German Hazardous Incident Ordinance. Other Seveso-establishments indicate that they have deviated only single measures but no changes regarding the overall system. These answers enable the conclusion that for nearly one quarter of the Seveso-establishments (“other”, “no entry”) no management review is implemented yet.

The remaining answers are diversified. Mainly they fall upon aspects of overriding importance such as “change of policy” and “change of measures to ensure compliance with the regulations of the SMS” (23 % of the Seveso-establishments for each). All in all 27 % of the Seveso-establishments refer to internal reporting systems confirming thereby the importance of the systematic evaluation of operational experience within the SMS.

Figure 5.7-1: Changes deviated from the management review



All in all it is arising from the answers that in the common praxis the management review is only of secondary importance for the initiation of change processes. Thus it is recommended to verify the proceeding and to consider adjustments to enhance the effectiveness of this process.

5.8 Other changes

Question 8.1 Have there been changes due to the implementation of the SMS but which are beyond the matter of plant safety?

Modifications of an existing management system were mentioned most frequently (53 % of the Seveso-establishments). This is due to the specific features of the SMS had to be added in the organisation. Examples (excerpts): „Integration in das IMS“, „integriert im QS-System“, „Erweiterung des Systems … um Belang des SMS“, „positive Veränderung“.

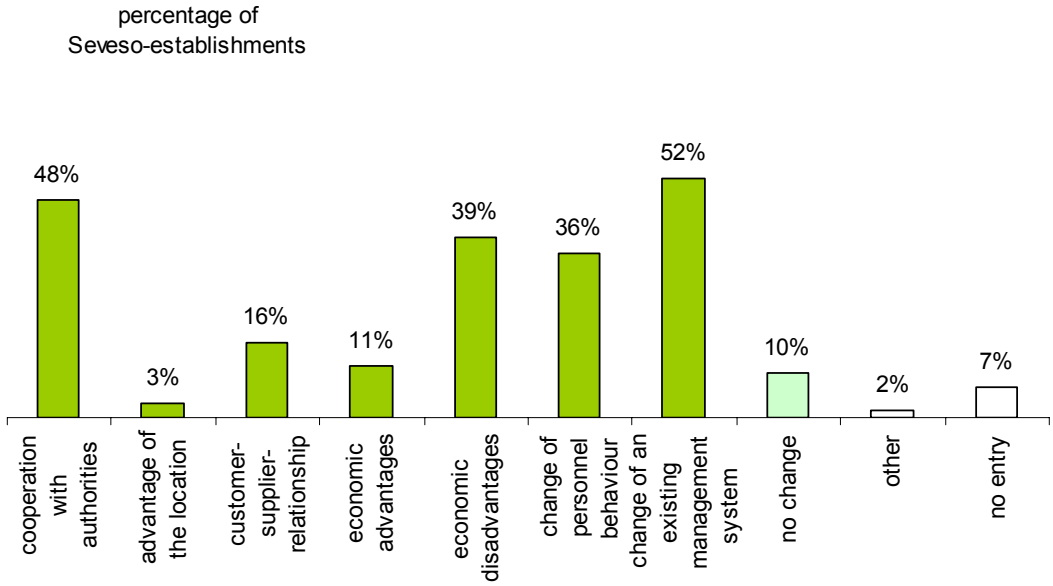
The additional effort is perceived as a disadvantage but is limited because in many cases the SMS could be integrated into existing structures. A complete reorganisation was not required. Positive effects were pointed out, too. This is because the synergies with operational tasks could be utilised and the systematic configuration of procedures resulted in an increasing efficiency.

Economic disadvantages (40 % of the Seveso-establishments) resulted from additional requirements on personnel, training and documentation as well as from the cooperation with authorities. Examples (excerpts): „zu hoher administrativer Aufwand“, „Dokumentation“, „Schulung“, „erhöhter Aufwand, da Behördenberücksichtigung“, „durch die erforderlichen Dokumentationen entsteht … ein erheblicher Zusatzaufwand, was die Produktivität senkt“.

Even in the context of other subjects of the questioning it is confirmed that the amount of regulations has grown and that the effort for training and documentation has increased.

Several positive effects were indicated which are associated with the implementation of the SMS. The cooperation with authorities was facilitated, due to the implementation of the SMS (e. g. regulations, documentation) the verification management became easier and the proceeding became more transparent. Examples (excerpts): „Nachweise einfacher für Behördenumgang“, „SMS erleichtert Transparenz des Unternehmens gegenüber den Behörden“. Thus the SMS contributes to an enhanced communication between companies and authorities. The SMS also affects the relationship to clients and suppliers transcending the particular interests of the company and contributes to an advanced external presentation. Examples (excerpt): „Akzeptanz”.

Figure 5.8-1: Other changes



On a remarkable extend (37 %) a change of personnel behaviour was achieved. Examples (excerpts): „Vorschlagwesen“, „zusätzliche Sensibilisierung … für Anlagensicherheit“, „… verantwortungsbewusster und … auf Notfallsituationen besser vorbereitet“.

Due to the interactions between man, technique and organisation/management the change of personnel behaviour is safety related, too. Furthermore it can be assumed that the change of behaviour influences all operational procedures and the advantages are not limited to the SMS.

From the view of the respondents the fundamental disadvantage in the context of the implementation of the SMS resulted from the economic load which was arising from an increasing effort (time, personnel) for certain processes. This disadvantage can directly be measured. Against this the positive effects arising from the implementation of the SMS are standing. The advantages (e. g. forced or easier permission, prevention of incidents, motivation of personnel, increasing acceptance) are also of economic importance but normally they can not clearly be assigned and calculated. In parts you have to wait for the results from a long-term progress.

Table 5.8-1: Other changes due to the implementation of the SMS (advantages, disadvantages)

change	**percentage of Seveso-establishm.**	**advantage** / **disadvantage**	
change of the management System	53 %	positive development	
		extension of the system according to the SMS; integration into the IMS; integrated in the QS-system; environment management system was available	
cooperation with authorities	48 %	verification easier; higher transparency	
economic disadvantages	40 %		additional effort for personnel, training, documentation, cooperation with authorities; extensive time requirement (decreasing productivity)
change of personal behaviour	37 %	suggestion system; awareness raising for plant safety; more responsible behaviour; better emergency preparedness;	
relationship to clients and suppliers	17 %	acceptance	
economic advantages	12 %	*(no explanation)*	
advantage of location	3 %	*(no explanation)*	

All in all, the answering illustrates that an isolated view on the economic loads is not appropriate. The number of positive effects is prevailing. A simplified overall assessment is not possible by calculating together the advantages and disadvantages, for the reasons as mentioned. Anyway the knowledge of possible advantages provides references to economic relevant interactions which can be considered in the further development of the SMS. Considering an overall view it might be seen, that the economic extra effort is of secondary importance in contrast to the summation of other advantages.

6 Summary

In the course of the project effects of Safety Management Systems on plant safety were analysed based on change processes. For that purpose within a questioning changes in Seveso-establishments were determined and evaluated which are in the context of the implementation of the SMS according to appendix III of the German Hazardous Incident Ordinance as from 2000. The questioning was addressed to Seveso-establishment according to the German Hazardous Incident Ordinance in North Rhine-Westphalia. 63 questionnaires returned to be considered in the evaluation.

Below, the main results were summarised.

General information

The reply considers relevant industrial key sectors. Due to the distribution of involved companies it is possible to come to trans-sectoral findings. Even Seveso-establishments being subject to the “basic obligations”, which are not obliged to describe their SMS in the safety report, have participated on an important extend. The answering illustrates that the SMS is implemented and is essential for Seveso-establishments irrespective of the categories used in the German Hazardous Incident Ordinance.

The majority of the reply derives from Seveso-establishments which have been less than ten years subject to the German Hazardous Incident Ordinance. Mostly, an experience over several years is available since the implementation of the SMS. Thus the Seveso-establishments had the ability to identify change processes and to give specific information.

The implementation of the SMS has influenced the development of the common management system, too. It has resulted in a consistent and well-structured configuration of the common management system.

Written regulations

A general characteristic of the change processes is the clear increase of written regulations for the individual processes of the SMS. This means a positive progression because by this consistent and transparent procedures are ensured and an enduring development is supported.

Only a few Seveso-establishments have given precise information on the title of written regulations. It remains as a question whether specific stipulations are established related to the different subjects. Possibly only higher-ranking or general documents are provided which are not in compliance with the requirements to be met by a management system.

Organisation and personnel

The implementation of the SMS required changes of the organisational structure. Tasks were extended and new positions were added, especially for small Seveso-establishments. Major Seveso-establishments in many cases (nearly the half) could integrate the SMS in the existing organisational structure.

The demand for training has increased clearly since the implementation of the SMS. Nearly for all Seveso-establishments the training programs were modified. Due to the SMS specific personnel requirements were established which had not been considered in the scope of the training programs before. The changes regarding the different elements of the SMS (e. g. operating instructions, management of changes) have to be considered in the training. In addition there is an intensified orientation to the external staff.

Identification and evaluation of major hazards

Within the SMS a systematic verification of the existing major hazards analyses was performed. In doing so, deficiencies were identified for a considerable percentage of the Seveso-establishments (74 %). Existing analyses were revised. New analyses were added. For the “Identification and Evaluation of Major Hazards” the maximum demand for written regulations could be seen after the implementation of the SMS. This enables the conclusion that only on the written regulations within the SMS a sufficient scope of major hazards analyses can be ensured.

Operational control

Requirements on the verification and revision of existing working and operating instructions are given also beside the SMS. However, the verification in the context of the SMS resulted in extensive changes for about three quarters of the Seveso-establishments. This can be explained by the fact that the SMS is connected with specific aspects which had not been considered in the existing procedures so far. Moreover, due to the systematic configuration of the SMS interrelations can be identified, which can not be identified by viewing isolated at single procedures.

Safe management of changes

The implementation of rules for the safe management of changes caused an increased effort for the realisation of changes for the majority of Seveso-establishments. At same time for one quarter of the Seveso-establishments a progression of effort in the opposite direction can be seen. Due to the regulation a higher efficiency of the management can be achieved obviously.

It is a positive effect that for one third of the Seveso-establishments the number of deficiencies has decreased which have occurred as a consequence of changes. By control measures which have been implemented as parts of the SMS and which are accompanying the realisation of changes, faults can be detected in time before they may result in more serious consequences.

Planning for emergencies

Changes of the emergency organisation were more extensive than the impacts on the general organisation. The highest demand for adjustments referred to external interactions (communication, authorities), which have to be considered to a greater extend than in the management of internal procedures.

Regarding the emergency plans the specific impact of the SMS aims at formal aspects of the review. This can be explained by the increase of regulations related to this subject in the context of the SMS. Against this, changes with regard to contents of the emergency plans were necessary only for a few Seveso-establishments.

Emergency scenarios were revised nearly for half the Sveso-establishments. The changes as described required correspondent adjustments regarding emergency training and emergency exercises.

Monitoring of SMS performance

The monitoring of SMS Performance is an important and efficient element of the management system. From this a remarkable return of safety related findings is arising. A continuous monitoring contributes to the fact that adverse trends may be detected in time. Arising from the monitoring of SMS performance three quarters of the Seveso-establishments have deviated changes for safety related processes.

Obviously, different criteria were used for the determination of deviations. Thus a direct comparison of information arising from different Seveso-establishments is not possible. Only for one Seveso-establishment operational experiences were determined in a way which enables an estimation of the trend. For this Seveso-establishment the positive effect of the SMS can be seen. The number of reported deviations has decreased continuously. The remaining Seveso-establishments give reason to verify their proceeding referring to this.

The predominant part of the Seveso-establishments evaluates operational experience. The systematic evaluation results in findings, which are of similar importance for contributing factors from man, technique and organisation/management. The Seveso-establishments have widely implemented an integrated but not exclusively technique-oriented understanding of safety.

Management review

The verification of the SMS based on the management review has been only of secondary importance for the initiation of change processes so far. In general it seems to be necessary to enhance the effectiveness of this process. Arising from the management review only about half the Seveso-establishments have deviated measures. For nearly a quarter of the Seveso-establishments it can be assumed that no management review is implemented yet.

Other changes

The economic load arising from an increasing effort (time, personnel) for certain procedures is perceived as a disadvantage. Against this the positive effects of SMS have to be seen, especially the more facile cooperation with authorities (better verification management), the increasing acceptance influencing the relationship with clients and suppliers, as well as the changing of personnel behaviour. The advantages are also of economic importance but normally they can not clearly be assigned and calculated.

Regarding the multitude of advantages an isolated view on the economic loads is not appropriate. An overall view may come to the result that the summation of other advantages would exceed the importance of the economic extra effort.

Appendix: Questionnaire

Effects of Safety Mangement Systems in Seveso-establishments

- questionnaire regarding change processes -

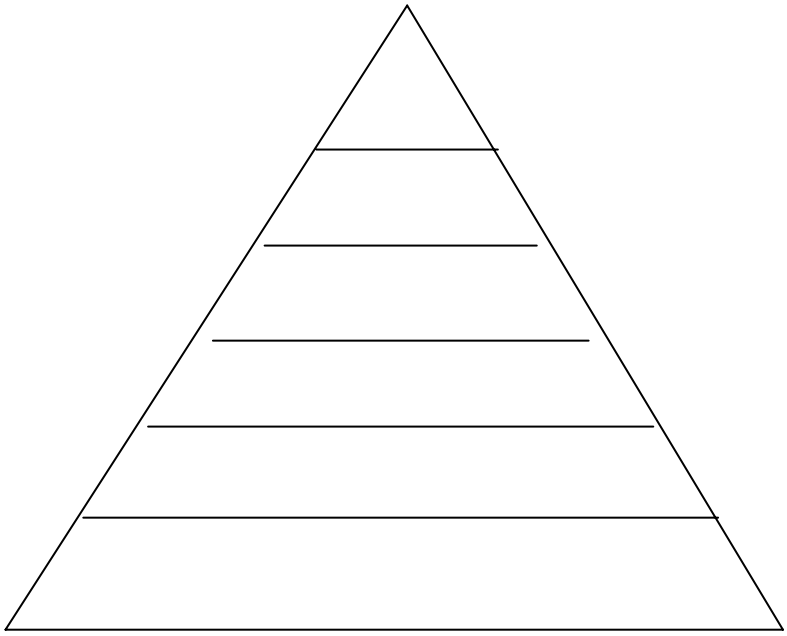
internal number: __ __ __ (please do not fill in)

0	General information
0.1	General information on the Seveso-establishment. name: industrial sector (please use shortlist: see attachment) ... The Sevseo-establishment is according to §1(1) of the German Hazardous Incident Ordinance ☐ subject to the „basic obligations“ ☐ in addition, subject to the „extended obligations“. since (year): Size of the company, number of employees at quantity Explanation for changes (e.g. reorganisation) - 31 December 1999 - 31 December 2008
0.2	General information on the Safety Management System (SMS) At what time the SMS was implemented in your Seveso-establishment?
0.3	General information on the management system. Describe the configuration of the management system in your Seveso-establishment at the following dates - 31 December 1999 (prior to the implementation of the SMS) - 31.December 2008 For explanation an exemplified configuration is displayed.

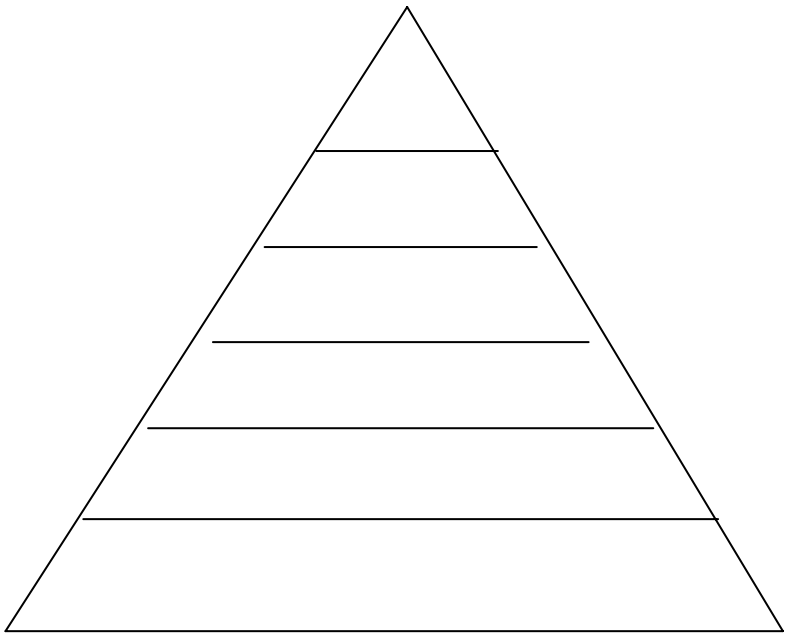
Configuration of your management system in the Seveso-establishment at 31 December 1999 (prior to the implementation of the SMS):

☐ no management system available at this date (31 December 1999)

☐ management system available at this date (31 December 1999), using the following configuration



☐ Configuration of your management system in the Seveso-establishment at 31 December 2008.



1	Organisation and personnel	
1.1	What changes of the existing organisational structure resulted from the implementation of the SMS?	
	please mark where applicable	explanations (e. g. description of the change, implementation of tasks as management commissioner)
	☐ tasks and responsibilities of existing organisational units or positions were modified	
	☐ jobs/positions requiring new qualifications were added	
	☐ no change; tasks and objectives of the SMS were already considered in the existing organisational structure	

1.2	Regulation for Training Programs		
	Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?		Did a corresponding regulation exist prior to the implementation of the SMS?
	subject	title of the regulation / document no..	please mark, explanations when appropriate
	☐ contents of training		☐ yes / ☐ no
	☐ number of training units		☐ yes / ☐ no
	☐ concerned persons		☐ yes / ☐ no
	☐ verification of training program participation		☐ yes / ☐ no

1.2.1	Has the participation in the training program been verified since implementation of the SMS??	
	please mark, where applicable	explanations (time intervall, reason)
	☐ verification according to a defined timing	
	☐ verification for especial cause	
	☐ no verification	
	☐ other:	

1.2.2	Have the training programs been modified since the implementation of the SMS?	
	a) safety related contents of training programs	
	please mark, where applicable	explanations (contents/subjects)
	☐ new subjects or focussing of subjects, especially safety related contents	
	☐ special training or extension of training for external staff	
	☐ no modification of training program contents	
	☐ other:	

b) number of safety related training units

please mark, where applicable	explanations (number / frequency)
☐ more frequent	
☐ less frequent	
☐ constant	
☐ other:	

c) extension of the personnel to be concerned in safety related training - involving additional persons or organisational units

please mark, where applicable	explanations (concerned personnel / subjects)
☐ internal staff	
☐ external staff	
☐ no change of the personnel to be concerned	
☐ other:	

1.3 Regulations for personnel selection and placement.

Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects		Did a corresponding regulation exist prior to the implementation of the SMS?
subject	title of the regulation / document no.	please mark, explanations when appropriate
☐ criteria for personnel selection		☐ yes / ☐ no
☐ criteria for personnel placement		☐ yes / ☐ no
☐ criteria fort sub-contractor placement		☐ yes / ☐ no

1.3.1 Have the criteria for selection and placement of personnel been changed since the implementation of the SMS?

please mark, where applicable	explanations
☐ increased consideration of safety related competences in decisions made to define tasks and responsibilities of the internal staff	
☐ increased consideration of safety related competences for the selection of sub-contractors	
☐ no change	
☐ other:	

2	Identification and evaluation of major hazards		
2.1	Regulations for the identification and evaluation of major hazards.		
	Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?		Did a corresponding regulation exist prior to the implementation of the SMS?
	subject	title of the regulation / document no.	please mark, explanations when appropriate
	☐ responsibilities and personnel to be concerned		☐ yes / ☐ no
	☐ selection of analyses methods		☐ yes / ☐ no
	☐ scope of the analyses		☐ yes / ☐ no
	☐ reevaluation of hazards		☐ yes / ☐ no
2.1.1	Has a reevaluation of major hazards been performed since the implementation of the SMS?		
	please mark, where applicable		explanations
	☐ existing analyses were verified		
	☐ analyses considering a modified scope		
	☐ analyses considering new methods		
	☐ additional analyses for scenarios not considered as yet (e. g. hazards, source term, impacts)		
	☐ a reevaluation was not necessary		
	☐ other:		

3	Operational control		
3.1	Regulation for operational instructions.		
	Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?		Did a corresponding regulation exist prior to the implementation of the SMS?
	subject	title of the regulation / document no.	please mark, explanations when appropiriate
	☐ verification of existing working and operating instructions		☐ yes / ☐ no
	☐ revision of existing working and operating instructions		☐ yes / ☐ no
	☐ implementation of new or revised working and operating instructions		☐ yes / ☐ no
3.1.1	What effects on working and operating instructions were caused by the implementation of the SMS?		
	a) What effects on working and operating instructions were caused by the implementation of the SMS?		
	please mark, where applicable		explanations (concerned personnel / subjects)
	☐ existing working and operating instructions were verified		
	☐ existing working and operating instructions were revised		
	☐ additional working and operating instructions were initially released		
	☐ no change / other:		
	b) What was the reason for the modification of working and operating instructions?		
	please mark, where applicable		explanations
	☐ change of the process, input of substances, etc.		
	☐ operational experience (incidences, disturbances)		
	☐ amended regulations		
	☐ hazard analyses		
	☐ other:		

4	Safe management of changes		
4.1	Regulations for the safe management of changes.		
	Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?		Did a corresponding regulation exist prior to the implementation of the SMS?
	subject	title of the regulation / document no..	please mark, explanations when appropriate
	☐ planning of changes		☐ yes / ☐ no
	☐ realisation of changes		☐ yes / ☐ no
	☐ surveillance of changes (planning, realisation)		☐ yes / ☐ no
	☐ starting up after changes		☐ yes / ☐ no
4.1.1	What changes resulted from the implementation of the SMS?		
	a) revision of rules for the management of changes		
	please mark, where applicable		explanations
	☐ existing rules were verified		
	☐ specific rules were added		
	☐ existing rules were modified		
	☐ no change, existing rules are sufficiently		
	b) How have the personnel been instructed after the realisation of changes regarding the consequences of the changes?		
	pease mark, where applicable		explanations
	☐ training contents were extended		
	☐ additional personnel or organisational units were involved in the training		
	☐ number of training units was modified		
	☐ no change		
	☐ other:		
4.2	What experience resulted from the implementation of rules for the safe management of changes?		
	a) progression of effort (time, personnel) all in all for the realisation of changes.		
	please mark, where applicable		explanations (possible causes)
	☐ increased effort		
	☐ decreased effort		
	☐ no change		
	☐ other:		
	b) trend: number of occurring as a consequence of changes		
	please mark, where applicable		explanations
	☐ increase, more faults		

	☐ decrease, less faults	
	☐ no change	
	c) other findings:	

5	Planning for emergencies		
5.1	Regulations for the planning for emergencies		
	Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?		Did a corresponding regulation exist prior to the implementation of the SMS?
	subject	title of the regulation / document no.	please mark, explanations when appropriate
	☐ emergency organisation		☐ yes / ☐ nein
	☐ emergency plan		☐ yes / ☐ nein
	☐ emergency scenario		☐ yes / ☐ nein
	☐ emergency training		☐ yes / ☐ nein
	☐ emergency exercise		☐ yes / ☐ nein
5.1.1	What changes resulted from the implementation of the SMS?		
	a) emergency organisation		
	please mark, where applicable		explanations
	☐ change of the internal organisational structure		
	☐ change of communication and cooperation with other parties		
	☐ no change		
	☐ other:		
	b) emergency plan		
	please mark, where applicable		explanations
	☐ change of the review cycle for emergency plans		
	☐ change of the proceeding used for the revision of the emergency plans		
	☐ no change		
	☐ other:		
	c) emergency scenario		
	please mark, where applicable		explanations
	☐ new or modified emergency scenarios		
	☐ new or modfied provisions for emergency response		
	☐ no change		
	☐ other:		
	d) emergency training		
	please mark, where applicable		Explanations
	☐ increasing frequency		

	☐ decreasing frequency	
	☐ change of emergency training contents	
	☐ change of methods (e. g. simulator)	
	☐ change of persons to be concerned (internal/external)	
	☐ no change	
	☐ other:	
	e) emergency exercises	
	please mark, where applicable	explanations
	☐ increasing frequency	
	☐ decreasing frequency	
	☐ change of emergency training contents	
	☐ change of methods	
	☐ change of persons to be concerned (internal/external)	
	☐ no change	
	☐ other:	

6	Monitoring of SMS performance		
6.1	Regulations for the monitoring of SMS peformance		
	Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?		Did a corresponding regulation exist prior to the implementation of the SMS?
	subject	title of the regulation / document no.	please mark, explanations when appropriate
	☐ verification, how the requirements on the SMS have been met by the Seveso-establishment (audit system)		☐ yes / ☐ no
	☐ documentation of the audit		☐ yes / ☐ no
	☐ determination of actions resulting from the audits (follow-up actions)		☐ yes / ☐ no
	☐ implementation of follow-up actions		☐ yes / ☐ no
	☐ surveillance of the implementation		☐ yes / ☐ no
6.1.1	For what processes actions were deviated arising from the monitor-ing of SMS performance (audit)?		
	subject		explanation
	☐ personnel training		
	☐ personnel selection and placement (internal and external staff)		
	☐ identification and evaluation of major hazards		
	☐ working and operating instructions		
	☐ management of changes		
	☐ planning for emergencies		
	☐ no measures		
	☐ other:		
6.2	Regulations for the evaluation of operational experience		
	Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?		Did a corresponding regulation exist prior to the implementation of SMS?
	subject	title of the regulation / document no.	please mark; explanations when appropriate
	☐ reporting / collecting of events, incidents and disturbances		☐ yes / ☐ no
	☐ investigation / evaluation of events, in-		☐ yes / ☐ no

	cidents and disturbances		
	☐ actions / consequences derived from the evaluation of events, incidents and disturbances		☐ yes / ☐ no

6.2.1 Progression after the implementation of the SMS

a) reported deviations (events, incidents, disturbances)

year	number		Explanation
	total	safety related	
2001 2002 2003 2004 2005 2006 2007 2008			

b) what safety related measures were deviated from the evaluation of operational experience?

measure	explanation
☐ technical measures to improve safety	
☐ organisational measures to improve effectiveness and reliability of safety related equipment (e. g. inspection, maintenance, control)	
☐ modification of the management system (e. g. personnel selection, training concept)	
☐ measures to prevent operating errors (e. g. instructions, interlocking)	
☐ no measures	
☐ other	

7	Management review		
7.1	Regulations for the management review.		
	Are there written regulations provided for the Seveso-establishment covering stipulations for the following subjects?		Did a corresponding regulation exist prior to the implementation of the SMS?
	subject	title of the regulation / document no.	please mark; explanation, when appropriate
	☐ management review		☐ yes / ☐ no
7.1.1	What changes of the SMS were deviated from the management review?		
	please mark, where applicable		explanation
	☐ change of policy		
	☐ change of organisational structure		
	☐ change of measures to ensure compliance with the regulations of the SMS		
	☐ change of monitoring of SMS performance		
	☐ initial release of an internal reporting system for collecting and evaluating events, incidents and disturbances		
	☐ modification of an internal reporting system		
	☐ no change		
	☐ other:		

8	Other changes
8.1	Have there been changes due to the implementation of the SMS but which are beyond the matter of plant safety? ☐ cooperation with authorities ☐ advantage of the location ☐ effects on customer-supplier-relationship ☐ economic advantages (e. g. insurance, contracts) ☐ economic disadvantages (e. g. increasing administrative effort, additional personnel demand) ☐ change of personnel behaviour (e. g. frank communication) ☐ change of an existing management system due to the integration of the SMS ☐ no change ☐ other:

Questionnaire Attachement I: Shortlist „Industrial Sector“

answering of question 0.1: General information on the Seveso-establishment

Industrial Sector

agriculture
forestry
coal mining
energy industry (electricity, gas, water and district heating power plants)
liquid gas storage, tank farm
biogas plant
iron an metal production
metal industry, iron and steal, galvanic industry
petroleum processing, coal industry
chemical industry, pharmaceutical industry
plastics processing
elastomeric and asbestos processing
glass production
industrial wood processing
paper manufacture, paper converting
abattoirs, meat products industry
drink production
tank farm
waste management, waste disposal, waste recycling
waste combustion
shipping and storage
other

Questionnaire attachment II: feedback

optional

Do you have comments or proposals regarding the configuration of the questionnaire (e. g. character and scope of the questions, comprehensibility)?

Below you will have the possibility to express your remark. We look forward to your feedback.