

Optional evening activities - Presentations

Training of sprayer inspectors – a Swedish approach

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Summary

Sweden has a national regulated system with voluntary inspection of sprayers since 1988. As the purpose with sprayer inspection is risk reduction and reduced use of pesticides, also advising and minor repairs can be made by the inspector. Swedish sprayer inspectors' training consists of two parts:

A four day course for pesticide users, with approved results in written exam. The training shall be refreshed every five year by a one-day course with written exam. A four day technical course for sprayer inspectors with approval in written and oral exams. The training shall be refreshed every second year by a one-day course. Participation in refresher courses are demanded to keep approval as inspector. The training is guided by regulations from the Board of Agriculture who is also responsible for the training course and examination. Inspectors training course has on the agenda; regulations on inspection, environmental background for sprayer inspection, test-methods and test-equipment, practical exercises with test protocol, different test equipment and sprayers, application technique theory and practical on nozzle choice, drift reducing techniques, sprayer maintenance and sprayer calibration, as this is a part of the inspection. A special material for training of sprayer inspectors has been developed based on EN 13790 part 1.

Introduction

In 1988 a system for voluntary inspection of sprayers in use was introduced in Sweden as one part of a national program for reduction of use of pesticides and reduction of risks with pesticides. The activities are regulated by regulations from the Swedish Board of Agriculture. The inspectors are mainly employed as mechanics in workshop or have their own private enterprise. The system was introduced for boom-sprayers only.

The activities on sprayer inspection are financed by a repayment of pesticide tax. Since the start of the activities there has been a financial support to buy test equipment. At present the support is up to 75% of the approved cost for investment, with a maximum of 165000 SEK. In some periods there have also been financial supports for the performed tests in order to get more owners of sprayers interested. As a way of improving knowledge among spray operators the inspectors are trained in application technology and environmental motives for sprayer inspection. The inspectors are also allowed and encouraged to repair the sprayer.

As inspection of sprayers in use is received positive from the stakeholders approved, regularly performed inspections has later been part of demands in Integrated Production, the contract for sugar beet growers and in most water protective areas. Inspection of sprayers has also been introduced into some environmental support systems.

The regulations and guidelines have been national till 2008 when the regulations was changed and the inspection must follow the European norm EN 13790 - Inspection of sprayers in use; part 1: field crop sprayers and part 2: Air-assisted sprayers for bush and tree crops. Some extra national regulations are also introduced. To minimise risks for pollution of water, the place where the inspections is performed must fulfil the same national demands as the place where the sprayer could be cleaned. This can be on biological active ground or on a place where the water sprayed out is collected. To demonstrate to the owner that there are no leakages from the tank, the tank must be completely filled with water. This demand is based on experience that leakages may occur on upper parts of the tank where pipes and hoses are led into the tank. The pump-flow meter must have a transparent part to demonstrate that there are no air-leakages on pipes and hoses to the pump. Air leakage will cause bubbles in the pipes that will be visible in the transparent tube. Furthermore a calibration of the sprayer and tractor speed must be performed. Examples of water rates for all present nozzles must be given

Training of the sprayer inspector

The training of sprayer is demanded in regulations by the Swedish Board of Agriculture. For basic training to be approved the sprayer inspector first has to attend and be approved at a four-day course for professional users of plant protection products and attend a four-day technical course for sprayer inspectors, also with approval in exams. To keep the approval the inspector has to attend and pass exams at mandatory one-day refresher courses for pesticide users every five year plus a one-day refresher course for sprayer inspectors every 2 years.

Since 1990 it is mandatory for all professional users of plant protection products to attend and be approved at training-courses. The approval is achieved by attending a four-day basic course and then the refresher courses. Approval at the written exams is necessary. The course plan is regulated by the Swedish Board of Agriculture. Responsible for arranging the training-courses and exams are Regions and Provincial Government. To pass the exam it is necessary to have answered correct on questions on how to determine wind-based buffer zones and how to calculate dosage and calibrate the sprayer.

Technical course

The technical course for sprayer inspectors is arranged by the Swedish Board of Agriculture who is also responsible for the examination of the inspectors. The course has a mixture of theory and practical. The course is intensive with activities from 8.00 – 17.30 each days and evening studies are necessary for the participants. To allow a level of good training a number of 12 participants is desirable and with maximum of 16 participants. For the course it is necessary to have access to lecture room and bigger hall with space for four tractors and sprayers with boom folded out and different complete testing equipment. It is important to have access to different sprayer components like pumps, pressure gauges, manifolds, filters, nozzles etc for demonstrations during theory sessions. The course plan is as follows:

Day 1:

Introduction to the course:

- Short practical demonstration of inspection and test equipment.

- Background and motives to sprayer inspection.

- Environment protection and environmental risk with sprayers.

Novelties on sprayer market.

Inspection of sprayers in Europe.

The inspection procedure:

- Demands on sprayer parts and test methods.

- Theory on sprayer components that are tested.

- The test protocol.

Day 2:

Test equipments, demands and presentation of available equipment.

Personal protection equipment for sprayer inspectors.

Group practical:

- Inspection and test equipment. Complete inspection according to the test protocol. On four stations with different sprayer types and different test equipment the participants train how to perform a test. Each test last 1,5 hour, total 6 hours. Both patternator-test and nozzle-flow test on the boom are performed.

Application technology: Theory

- Droplets-size, spray quality, spray deposit, liquid rates, spray liquid concentration.

- Boom height, boom stability.

- Nozzle theory.

- Liquid rates in different crops.

- Biological effect of spraying.

- Spray drift and drift reducing technologies.

- Helper for drift buzzer zones and nozzle choice.

Day 3:

Group practical:

- Catalogues on sprayer components.
- Identification of filters, nozzles, droplet-sizes, pump-flow capacities.
- Nozzle properties.
- Nozzle flow, top angle, droplet size, coverage on water sensitive cards.
- Calibration of sprayers.
- Calibration methods, calculation and technical aids.
- Safety and good practise.
- Where to conduct the inspection. Environmental protection and influence of weather.
- Risks and use of personal protection equipment during inspection.
- Recommendation on maintenance on sprayers before and after spraying season.

An inspector's experience:

An invited sprayer inspectors talks freely and answers question during 1 hour about his experiences around sprayer inspection: sprayer's condition, test equipment, test-protocol, bureaucracy, pricing etc.

Repetition of test procedure and the test-protocol.

Day 4:

Examination:

- Part 1: Written exam 1 (no aids)
 - Rules for inspection.
 - Sprayer components.
 - Application technology.
- Part 2: Written
 - Find errors in an inspection report.
- Part 3: Written
 - Determine wind based buffer zones.
- Part 4: Oral exam at sprayer and test equipment on inspection procedure.

Regulations:

- Financial support for buying test equipment.
- Future for sprayer inspection.
- Quality assurance of sprayer inspection.

Group presentation of results of group practical.

Results of examination.

Evaluation of the course.

Training material

After almost two decades of basic- and refresher-courses for sprayer inspectors a need had grown for a training material specially made for sprayer inspectors. Previous material had been a mixture of regulations, articles, literature in application technique and material from manufacturers of sprayers and components. Also, a lot of experience had been collected from performing the courses, important input from sprayer inspectors and sprayer manufacturers as well as colleagues in European countries. In 2007 the Swedish Board of Agriculture started a work to develop a new training material based on the new coming regulations and test according to the standard EN 13790 part 1 – field crop sprayers.

The objective of the work was to develop a booklet with clear guidance for the inspectors how to perform a test. The task to develop the material was assigned a private consultancy with experience on training of sprayer inspectors, Visavi God Lantmannased AB. As a basis and inspiration for developing a structure and content in the material was used a presentation given at the first SPISE-workshop in Braunschweig 2004 (Ganzelmeier, 2004) where every paragraph in the test-procedure was commented with recommendation how to make the test in practise, ideas from Spanish colleagues who had started to

develop a material presenting the inspection procedure in a clear consistent structure (Gil 2007) and experience from staff training inspectors in Sweden. The booklet is on totally 50 pages. It follows the standard EN 13790-1 and the order in the test-protocol. Each paragraph in the test-protocol is dealt with on two, four or six pages. The structure is for each paragraph:

- an introduction to the feature to be tested,
- the relevant paragraph in EN 13790-1 is quoted regarding its requirements, method of verification and test method.
- description on how to perform the test of the feature e.g. how and where to attach measuring devices, used nozzle pressure depending on nozzle, boom height over patternator
- how to fill in the protocol
- practical guidelines and experiences on test methods, common failures on sprayers
- illustrating photos

One chapter is dealing with General requirements on how to perform the test e.g. the owner should be present during the test, the test has to be performed completely to be valid, how to act if the inspection is interrupted because of failure on the sprayer, which test equipment that can be used and demands on the place where the inspection is done to avoid water pollution. One chapter is dealing with preparations before the test. The inspector should before the test inform the owner that the sprayer shall clean, filled with water and prepared for calibration. The inspection should begin with a "rough-test" to see if there are any major failures that may cause that the inspection could not be performed. An additional recommendation is to visually inspect the sprayer's chassis, wheels and connections to tractor and inform the owner if there are any damages. A paragraph is dealing with recommendations on personal protective equipment that the inspector should use during the tests. One chapter is dealing with the extra national requirement that the sprayer shall be calibrated. One chapter is dealing with requirements on the test equipments. Examples are given on a completely filled in test-protocol and sticker.

A first version was elaborated and tested on ca 80 inspectors on refresher courses in 2008. The comments from the experienced inspectors where considered in developing the final version. Comments from inspectors where a.o. the need of information on filter colours and corresponding mesh numbers from different filter manufacturers, ISO nozzle colour-code and recommendations on test pressure for different nozzle types. The finished version is the official training material published by the Swedish Board of Agriculture. The finished version was send out to all approved sprayer inspectors in 2008 and was used first time on a basic course in spring 2009.

Except from the official training booklet also other material is given to the participants in training courses. All representatives of sprayers, sprayer components and test equipment on the Swedish market are invited to provide information material to the participants at the course. National regulations and guidelines relevant to sprayer inspectors are provided as well as relevant articles and research results.

Experiences

The booklet was very well received by the sprayer inspectors who appreciate to have all relevant information collected in one place. The booklet is used as a reference material during inspections and to show sprayer owner in case of discussions about tests. It is assumed that the inspections are made with fewer errors. To develop a material takes considerable amount of time. A lot of work was done to take illustrating photos during tests in order to illustrate the method and to reflect different sprayer types and test equipments. Special attention has been given to solve the matter of copyright for the European standards. The standards can not be quoted without agreements with national standardisation bodies

References and acknowledgements

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