

## **A RECORD OF MANDERSTAM'S EXPERIENCE IN FIRE AND SAFETY**

### **ALGERIA**

Client: SOGEDIA (State Organisation)

Project: Setting up of a new vegetable oils and fats Complexity Factor

Location: Eastern Algeria

Services supplied by Manderstam: R.C.

We have acted as consultants to the government for setting up of a large vegetable oils and fats complex, from the feasibility study and planning stage to the drawing-up of specifications, preparation of tender documents and detailed bid analysis of turn-key offers. Oil extraction is based on solvent (hexane) extraction, and the complex is also to include high capacity distillation units for fatty acids and glycerine and soap plants, with bulk stores for raw materials, intermediate and finished products. Fire detection and fire fighting systems constituted an important aspect and had to comply with local regulations. They included heat/smoke sensors, sprinkler systems, extinguishers, hydrants, foam inlets, break-glass points, interconnected alarm systems, fire water storage and emergency diesel pumps.

### **EQUATORIAL GUINEA**

Client: UNIDO/Government

Project: Rehabilitation of palm oil mills

Location: Province of Rio Muni

Services supplied by Manderstam: R.D.

In a study carried out on behalf of UNIDO for the rehabilitation of palm oil extraction, treating and storage, particular attention was paid to fire prevention and fighting measures in areas characterised by limited supplied of water.

## TURKEY

Client ETIBANK

Project: Manufacture of boric acid

Location: Bandirma

Services supplied by Manderstam: D.I.S.

The client had retained Manderstam to design a continuous processing plant using local materials. The factory will be protected by both fixed and mobile fire protection systems.

## KENYA

Client: KEN REN

Project: Ammonia, nitric acid, ammonium nitrate NPK plant

Location: Mobasa

Services supplied by Manderstam: R

Plant based on the production of ammonia by steam reforming of naphtha. Oxidation of ammonia to nitric acid and production of ammonium nitrate. Manufacture with other imported components of NPK fertilisers.

Facilities included on-site storage of naphtha, fuel oil, anhydrous ammoniac and nitric acid. Review highlighted deficiencies in fire protection and safety systems, and recommended modifications.

## GHANA

Client: GENERAL HOLDINGS

Project: Tema Steelworks

Location: Accra

Services supplied by Manderstam: R

Tema Steelworks produces 45,00 tpa of bar, rod and light sections. Steel is produced from scrap using 2 x 10 ton electric arc furnaces, casting into a modern

continuous 3 strand machine. Billets are reheated by an oil fed, pusher reheating furnace, and shaped by a semi-continuous, cross country rolling mill.

Some castings are produced from a high frequency induction furnace, mainly for the cement industries. Because of the complexity of the site power feeds, and distribution creates a potential hazard. Fuel is stored in tanks localised to the varied installations.

#### Fire Fighting Equipment

Mobile units are utilised mainly for water provisions, a central station houses the fire engines and tenders, and is manned continually by a regular and well-trained force.

Foam systems are installed in key centres within the plant, and hand operated appliances are adequately placed.

Training of personnel, included also rudimentary first aid lessons, to ensure coverage when working a 3 shift system.

#### GREECE

Client: METALLURGIKI HALYPS S.A.

Project: Mini-Steelworks

Location: Almyron

Services supplied by Manderstam: C

The project involved was a 300,000 tpa mini-steelworks producing wire rod and hot rolled strip.

The project involved electric arc steelmaking from scrap and sponge iron, using 2 – 50 ton E.A.F.

Billets and slabs are produced from a 'S' type continuous casting machine. Reheating took place in a 60 tph pusher furnace, and the rolling mill was a combination continuous rod and strip type with thyristor controls.

#### Fire Fighting Equipment

Water systems were fed by a ring main with take off points linked to medium and high velocity installations, covering mainly the oil storage and feed areas, as well as general mill applications.

Foam and CO<sub>2</sub> systems were installed to provide for the sophisticated electrical components housed in huge motor rooms, cellars, sub-stations, and distribution panels.

## COLOMBIA

Client: COLTEJER S.A.

Project: Iron and Steel Foundries and Bar Rolling Mill

Location: Medellin

Services supplied by Manderstam: C

The fire fighting systems are associated with a 10,000 tpa iron foundry, a 10,000 tpa steel foundry and a 30,000 tpa rolling mill.

Associated melt shops, house, electric arc furnaces, inducted furnaces, and cupolas.

Process equipment comprises pneumatic conveyors, sand systems, various shot blast machines, machine shops and heat treatment furnaces.

The rolling mill includes reheating furnaces, heavy duty motor rooms, and distribution systems, oil storage tanks finishing process machines.

Fire fighting equipment systems associated utilise water ring mains for light and heavy duty sprays, foam and CO<sub>2</sub> systems for electrical buildings and shops.

The entire system covers 20 hectares of varied industry using automatic installations backed-up by mobile fire tenders.

## LIBYA

Client: LIBERIA PETROLEUM REFINING COMPANY

Project: Existing oil refinery

Location: Monrovia

Services supplied by Manderstam: R

A review of fire protection equipment, systems, and procedures, at the 15,000 BPD refinery at Monrovia was completed in July 1979.

This covered examination of fire water supplies, water storage and its adequacy, the distribution and hydrant systems, the mobile fire tender, foam installations in the tank farm, stocks of chemicals, and training of personnel in fire fighting. Recommendations included the provision of steam hoses and steam lances so that minor fires could be rapidly controlled.

## UNITED KINGDOM

Client: NYPRO (UK) LTD

Project: Flixborough Disaster – Public Enquiry

Location: Flixborough

Services supplied by Manderstam: R

One aspect of the Flixborough disaster was the failure of the installed fire protection system to give warning of the fires which were reported by eyewitnesses prior to the explosion. Manderstam, as part of their investigation into the probably cause of the plant failure, carried out an in-depth investigation into the detection, alarm and sprinkler systems as designed, as apparently installed and as found after the explosion.

Client: CATOMANCE LTD

Project: Industrial hazard investigation

Location: Welwyn Garden City

Services supplied by Manderstam: C

The Client manufactures finely powdered catalysts, many of which are spontaneously inflammable. Manderstam were engaged to review the safety and fire protection systems of the factory and advise on the facilities. Where necessary additional facilities were specified.

Client: BRITISH PETROLEUM – BRITANNIC HOUSE, LONDON

Project: Fire System Audit

Location: London

Services supplied by Manderstam: R

Investigation of existing fire fighting capability at oil treatment and pumping station.  
Preparation of statement of requirements.

## QATAR

Client: QATAR PETROLEUM PRODUCING AUTHORITY

Project: Rehabilitation and Extension of Fire Fighting Facilities

Location: Dukham

Services supplied by Manderstam: D, ,C, I, S

Ring mains, pumping stations, hydrants, hose reels, automatic spray systems, heat detectors, automatic shut-down systems, alarms, BCF extinguishing systems, water storage, access roads and routes etc to NFPA Codes of Practice and to API, ASME, ANSI, ASTM and BS codes and standards at Jaleha, Umm Bab, Fahahil Shipping Plant, Fahahil Pumping Station, Fahahil Degassing and Compression Station, Khatiyah Degassing and Pumping Station, Power Station, Fire Station and Municipality buildings.

Client: QATAR GENERAL PETROLEUM CORPORATION

Project: New Fire Fighting Facilities

Location: Umm Said

Services supplied by Manderstam: D, ,C, I, S

Ring mains, electrically driven fire pumps, hydrant, automatic spray systems, heat detectors, automatic isolation systems, alarms, GCF extinguishing systems on each tank, foam pourers, portable fire extinguishers, access roads and routes at Umm Said Tank Farm and Metering Station.

Client: QATAR PETROLEUM PRODUCING AUTHORITY

Project: New Fire Station

Location: Umm Said

Services supplied by Manderstam: D, ,C, I, S

New fire station including fire fighting facilities.

## INDONESIA

Client: PERTAMINA (INDONESIAN STATE OIL AND GAS CORPORATION)

Project: Fire and Safety Training College

Location: Sungai Gerong, South Sumatra

Services supplied by Manderstam: D,I

The College was designed to provide the most modern training facilities in fire fighting and fire and accident prevention, to increase the overall efficiency of the Fire and Safety Service personnel in Pertamina and offer training facilities to other organisations in Indonesia and South East Asia.

The College provided facilities for dealing with situations arising from the use of new as well as traditional construction materials. It also provided training facilities for dealing with situations in the commercial, industrial, transport and private housing sectors.

Special emphasis was made to take into account the specific conditions in the country. Facilities were also provided for the training of divers and security personnel.

Our design was based on the experience gained by the operation of the Fire Service Technical College in Moreton-in-Marsh, UK, adapted as found necessary to the local requirements in Sumatra. Great care was taken to ensure that all parts of the proposed College were suitable to local conditions and traditions.

Client: P.T. KRAKATAU STEEL, INDONESIA

Project: Design and installation of complete fire fighting system for 250,000 tpa steelworks

Location: Cilegon, West Java

Services supplied by Manderstam: D,C,I,R,S

The fire fighting system was designed utilising some original Russian delivered equipment, with additional purchases, to provide full coverage for many diversified departments and activities. The original Russian supply was completely overhauled and rehabilitated, and utilised wherever possible. The majority of this equipment was associated with the water fire fighting sections, whereas the new systems purchased provided foam and carbon dioxide protection.

## Manufacturing plant and services within the system

Rolling mills  
Cold wire drawing plant  
Spiral weld pipe shop  
30 m.w. power station  
Workshops  
Foundry  
Oxygen plant  
Oil storage  
Stores  
Administration buildings  
Laboratory

## Description of systems

- a) Water sprays – Supplied directly from a fire water ring main, and installed for the protection of external oil storage tanks, oil cellars loading bays, mills, and loading bays.

High and medium velocity sprays were positioned appropriately to application and operated automatically by installed sensors. Further manual water curtains and water fog systems completed the installation.

- b) Foam – The main oil cellars incorporated within the rolling mills were protected by low expansion foam pourers fed by pipelines positioned externally in the cellar outer walls.
- c) Carbon dioxide – Used solely to protect isolated, internal, unoccupied, transformer rooms and specific fire risks, such as computer rooms.

Activation of the carbon dioxide system would be triggered off by rate of rise heat detectors.

The whole system is monitored from a Central Works Fire Control room, being basically the communication centre which receives emergency calls, and directs operations. The Control Room was fully equipped with control desks, panels, alarms, location indicators, communication, and emergency aids.

The system was designed, and installed, over a 2 year construction period. The value of the equipment was US\$1,200,000 and finance was made available by the Indonesian Ministry of Industries.

Client: PERTAMINA (INDONESIAN STATE OIL AND GAS CORPORATION)

Project: Gas Turbine Power Station/Steam plant

Location: Plaju Refinery, South Sumatra

Services supplied by Manderstam: D, ,C, I, S

The power station incorporated two gas-turbine driven generators supplying electricity to the refinery. Gas was supplied from the refinery main and exhaust gases from the turbine were used to raise high pressure steam for process use.

Complete fire protection system was designed to cover the gas supply system and gas turbines, with remote sensing devices, automatic shut-down mechanisms and automatically operated sprinkler systems.

Client: PERTAMINA (INDONESIAN STATE OIL AND GAS CORPORATION)

Project: Sales-service plastics testing laboratory

Location: Jakarta

Services supplied by Manderstam: D, ,C, I, S

The laboratory incorporated one of each type of industrial plastic moulding, blowing, blow moulding, casting and filament machine installed or likely to be installed in Indonesia. In addition there were analytical and research laboratories. A workshop capable of maintaining the industrial equipment, bulk polymer stores, fuel tanks, etc. The laboratory was equipped with automatic sprinklers, foam points and carbon dioxide devices. Remote sensing devices were installed at critical points.

### SAUDI ARABIA

Client: SIR BRUCE WHITE, WOLF BARRY AND PARTNERS CONSULTANTS FOR THE PORT OF DAMMAM

Project: Storage and warehousing

Location: Dammam

Services supplied by Manderstam: D

Specification of fire protection systems for warehousing, storage, bunkering areas.

Client: ROYAL COMMISSION FOR JUBAIL

Project: Water supply and waste water facilities

Location: Jubail

Services supplied by Manderstam: D

As sub-consultant to Binnie and Partners, we were responsible for the design and water supply and waste water facilities for the Jubail Industrial City.

Manderstam's responsibilities included the preparation of process and instrument control diagrams, operation and maintenance instructions for the various facilities of water treatment and supply to both community and industrial areas.

Special facilities incorporated the design of industrial cooling and fire-fighting systems.

Client: PERTAMINA (INDONESIAN STATE OIL AND GAS CORPORATION)

Project: Polypropylene Plant

Location: Plaju Refinery, South Sumatra

Services supplied by Manderstam: C

Plant for production of polypropylene chips from polymerisation grade propylene using the Phillips Licence.

Catalyst system is pyrophoric and nitrogen blanketing had to be provided, together with fire water and foam systems to 120 feet structures.

## EGYPT

Client: G.A.R.G. (GENERAL AUTHORITY FOR THE REHABILITATION OF GINNERIES)

Project: New Cotton Ginnery (144 machines)

Location: Italy el Barud

Services supplied by Manderstam: D, C, I, S

This factory covers 51 acres and comprises eight bulk and cotton stores, two seed cotton blending halls, two gin halls each with 72 machines, two multi-storey seed rooms with machinery for sorting and sterilising cotton seed, two bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

Client: G.A.R.G. (GENERAL AUTHORITY FOR THE REHABILITATION OF GINNERIES)

Project: New Cotton Ginnery (144 machines)

Location: Zagazig

Services supplied by Manderstam: D, C, I, S

This factory covers 62 acres and comprises eight bulk and cotton stores, two seed cotton blending halls, two gin halls each with 72 machines, two multi-storey seed rooms with machinery for sorting and sterilising cotton seed, two bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

Client: G.A.R.G. (GENERAL AUTHORITY FOR THE REHABILITATION OF GINNERIES)

Project: New Cotton Ginnery (72 machines)

Location: Shirbin

Services supplied by Manderstam: D, C, I, S

This factory covers 47 $\frac{1}{2}$  acres and comprises four bulk and cotton stores, one seed cotton blending halls, one gin halls each with 72 machines, one multi-storey seed rooms with machinery for sorting and sterilising cotton seed, one bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

Client: G.A.R.G. (GENERAL AUTHORITY FOR THE REHABILITATION OF GINNERIES)

Project: New Cotton Ginnery (72 machines)

Location: Beni Suef

Owner: Arab Ginnery Company

Services supplied by Manderstam: D, C, I, S

This factory covers 47 acres and comprises one seed cotton blending halls, one gin halls each with 72 machines, one multi-storey seed rooms with machinery for sorting and sterilising cotton seed, one bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

Client: WADI GINNERY COMPANY

Project: Rehabilitated Cotton Ginnery (72 machiens)

Location: Kafr el Zayat (Wadi)

Services supplied by Manderstam: D, C, I, S

This factory covers 94 acres and comprises, after some demolition and rebuilding, three bulk and cotton stores, one seed cotton blending halls, one gin halls each with 72 machines, one multi-storey seed rooms with machinery for sorting and sterilising cotton seed, one bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

Client: DELTA GINNERY COMPANY

Project: Rehabilitated Cotton Ginnery (68 machines)

Location: Kafr el Dawar (Delta)

Services supplied by Manderstam: D, C, I, S

This factory covers 73 acres and comprises after some demolition and rebuilding, one seed cotton blending halls, one gin halls each with 68 machines, one multi-storey seed rooms with machinery for sorting and sterilising cotton seed, one bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

Client: NILE GINNERY COMPANY

Project: Rehabilitated Cotton Ginnery (60 machines)

Location: Zifta

Services supplied by Manderstam: D, C, I, S

This factory covers 58 acres and comprises, after some demolition and rebuilding, four bulk and cotton stores, one seed cotton blending halls, one gin halls each with 60 machines, one multi-storey seed rooms with machinery for sorting and sterilising cotton seed, one bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

Client: ARAB GINNERY COMPANY

Project: Rehabilitated Cotton Ginnery (60 machines)

Location: Mobasa

Services supplied by Manderstam: D, C, I, S

This factory covers 90 acres and comprises, after some demolition and rebuilding, four bulk and cotton stores, one seed cotton blending halls, one gin halls each with 60 machines, one multi-storey seed rooms with machinery for sorting and sterilising cotton seed, one bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

Client: NILE GINNERY COMPANY

Project: Rehabilitated Cotton Ginnery (60 machines)

Location: Kafr el Zayat

Services supplied by Manderstam: D, C, I, S

This factory covers 108 acres and comprises, after some demolition and rebuilding, four bulk and cotton stores, one seed cotton blending halls, one gin halls each with 60 machines, one multi-storey seed rooms with machinery for sorting and sterilising cotton seed, one bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

Client: DELTA GINNERY COMPANY

Project: Rehabilitated Cotton Ginnery (60 machines)

Location: Mir Yazid

Services supplied by Manderstam: D, C, I, S

This factory covers 52 acres and comprises, after some demolition and rebuilding, one seed cotton blending halls, one gin halls each with 60 machines, one multi-storey seed rooms with machinery for sorting and sterilising cotton seed, one bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

Client: ARAB GINNERY COMPANY

Project: Rehabilitated Cotton Ginnery (60 machines)

Location: Aboutig

Services supplied by Manderstam: D, C, I, S

This factory covers 31 acres and comprises, after some demolition and rebuilding, one seed cotton blending halls, one gin halls each with 60 machines, one multi-storey seed rooms with machinery for sorting and sterilising cotton seed, one bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

Client: MISR GINNERY COMPANY

Project: Rehabilitated Cotton Ginnery (60 machines)

Location: Aboutig

Services supplied by Manderstam: D, C, I, S

This factory covers 63 acres and comprises, after some demolition and rebuilding, one seed cotton blending halls, one gin halls each with 60 machines, one multi-storey seed rooms with machinery for sorting and sterilising cotton seed, one bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

Client: MISR GINNERY COMPANY

Project: Rehabilitated Cotton Ginnery (64 machines)

Location: Dairut

Services supplied by Manderstam: D, C, I, S

This factory covers 55 acres and comprises, after some demolition and rebuilding, one seed cotton blending halls, one gin halls each with 64 machines, one multi-storey seed rooms with machinery for sorting and sterilising cotton seed, one bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

Client: WADI GINNERY COMPANY

Project: Rehabilitated Cotton Ginnery (72 machines)

Location: Minia

Services supplied by Manderstam: D, C, I, S

This factory covers 166 acres and comprises, after some demolition and rebuilding, one seed cotton blending halls, one gin halls each with 72 machines, one multi-storey seed rooms with machinery for sorting and sterilising cotton seed, one bale pressing rooms and bale storage areas. Fuel oil storage. Pneumatic handling systems are widely used.

The fire protection systems comprises the necessary alarm systems, water pumping system, a hydrant water ring main plus hose reels and water.CO<sub>2</sub> extinguishers in the operational buildings.

UGANDA

Client SOUTH BUKED: COOPERATIVE UNION

Project: Rehabilitated Cotton Ginnery

Location: Busolwe and Daban

Services supplied by Manderstam: D, C, I, S

Rehabilitation of existing ginnery complexes damaged due to civil disturbances. Work covered redesign of operational and non-operational building with provision of fire fighting facilities.

Client: MASABA COOPERATIVE UNION

Location: Lukonge

Client: NORTH BUKED COOPERATIVE UNION

Location: Iki Iki and Kabole

Client: TESO COOPERATIVE UNION

Location: Bugondo

Client: LANGO COOPERATIVE UNION

Location: Namasale and Palango

Client: EAST ACHOLI COOPERATIVE UNION

Location: Parango

Client: SOUTH WEST NILE COOPERATIVE UNION

Location: Pakwach

Client: BUNYORO GROWERS COOPERATIVE UNION

Location:

## AFGHANISTAN

Client: AFGHAN GOVERNMENT - NORTH EAST REGION

Project: Rehabilitation of Cotton Processing, Oil Mills, Ghee and Soap Factories

Location: Kunduz Baghlan, Taloquan, Khawjaghar, Dasht Arci, Imam Sahib, Qalaizol

Services supplied by Manderstam: C

Fixed and mobile fire fighting facilities.

Client: AFGHAN GOVERNMENT - SOUTH WEST REGION

Project: Rehabilitation of Cotton Seed Processing

Location: Lashkargah, Girisht

Services supplied by Manderstam: C

Fixed and mobile fire fighting facilities.

Client: AFGHAN GOVERNMENT - WESTERN REGION

Project: Rehabilitation of Cotton Ginneries and Oil Mills

Location: Herat

Services supplied by Manderstam: C

Fixed and mobile fire fighting facilities.

Client: AFGHAN GOVERNMENT NORTHERN REGION

Project: Rehabilitation of Cotton Ginneries

Location: Mazar-L-Sharif and Balkh

Services supplied by Manderstam: C

Fixed and mobile fire fighting facilities.

## ETHIOPIA

Client: ETHIOPIAN FOOD CORPORATION

Project: Solvent Extraction of Oil Seeds and Vegetable Oil Refining and Storage

Location: Mojo

Services supplied by Manderstam: C

Fixed and mobile fire fighting facilities.

Client: SIDA

Project: Soyabean Processing and Product Storage

Location: Addis Ababa

Services supplied by Manderstam: C

Fixed and mobile fire fighting facilities.

Client: UNITED OIL MILLS AND SOAP FACTORY

Project: Rehabilitation and Expansion of Oil Mills and Soap Factory

Location: Addis Ababa

Services supplied by Manderstam: C

Fixed and mobile fire fighting facilities.

## MALI

Client: SEPOM (STATE-OWNED COMPANY)

Project: Rehabilitation and expansion of a vegetable oils and fats complex

Location: Koulikoro

Services supplied by Manderstam: R, D

Investigations of fire prevention and fire fighting systems for facilities including vegetable oil extraction, soap production, fatty acids production units, glycerine distillation, bulk stores for the oilseeds, cakes and finished products.

The project covered the design and specification for the rehabilitation and expansion of a vegetable oil and fats complex, including processing bulk storage and handling.