



**TOGETHER**  
*for a sustainable future*

## OCCASION

This publication has been made available to the public on the occasion of the 50<sup>th</sup> anniversary of the United Nations Industrial Development Organisation.



**TOGETHER**  
*for a sustainable future*

## DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

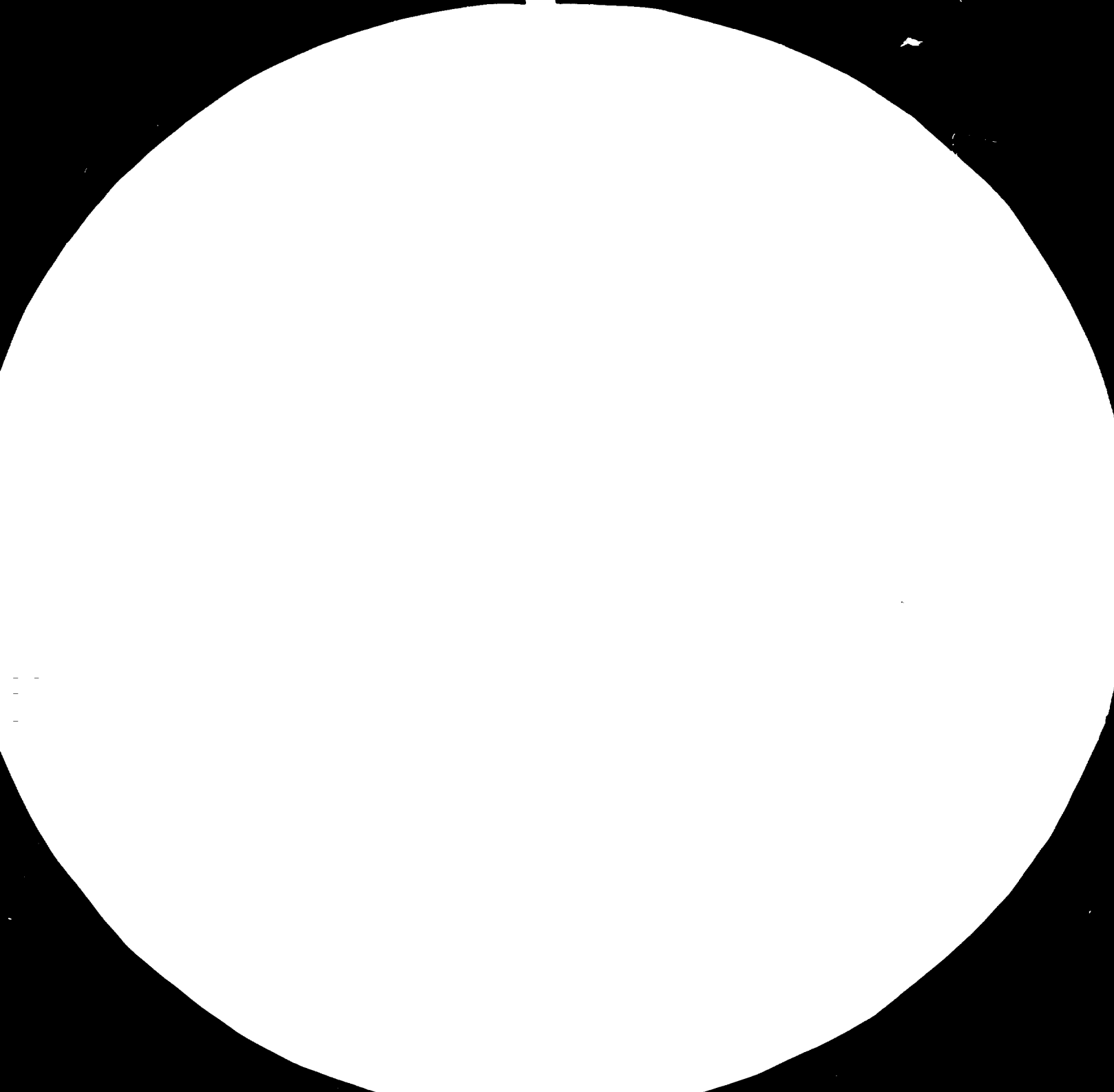
## FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

## CONTACT

Please contact [publications@unido.org](mailto:publications@unido.org) for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at [www.unido.org](http://www.unido.org)





3.2



4.5



MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-  
STANDARD REFERENCE MATERIAL, 1963-A  
ANSI and ISO TEST CHART No. 2

14162  
(1 of 4)

PROJECT FOR THE CHINA AGRICULTURAL MACHINERY  
TESTING CENTRE

UNITED NATIONS DEVELOPMENT PROGRAMME :

PROJECT DP/CPR/80/017

Contract concluded with CEMAGREF

for the project implementation

(United Nations Organization for Industrial Development :

contract T 81/23)

Missions to China by Mr. JANIN Jean-Louis

August 7 to 14, 1981

July 8 to 29 and October 24 to 28, 1983

Report by the consultants' team leader

1983

PROJECT FOR THE CHINA AGRICULTURAL MACHINERY  
TESTING CENTRE

---

*UNITED NATIONS DEVELOPMENT PROGRAMME :*

*PROJECT DP/CPR/80/017*

---

Contract concluded with CEMAGREF  
for the project implementation  
(United Nations Organization for Industrial Development :  
contract T 81/23)

---

*Missions to China by Mr. JANIN Jean-Louis*

*August 7 to 14, 1981*

*July 8 to 29 and October 24 to 28, 1983*

---

Report by the consultants' team leader

Project for the China Agricultural Machinery Testing Centre

UNDP Project DP/CPR/80/017 UNIDO Contract T 81/23

Missions to China by Mr JANIN Jean-Louis  
(August 7 to 14, 1981 ; July 8 to 29 and October 24 to 28, 1983)

Report by the consultants' team leader

SUMMARY

The report opens with an historical recall of the contract concluded between the CEMAGREF (1) and the U.N.I.D.O. (2) for the implementation of the project for the China Agricultural Machinery Testing Centre of Beijing and its final adoption in agreement with the United Nations staff from Vienna and Beijing together with the Chinese Authorities. It describes the placing of equipment's order and its sending to China, the Chinese trainees' education in France and the missions to China between July 8 and October 28, 1983 by the CEMAGREF consultants and their assistants. It presents in conclusion some suggestions for the Centre's continuing activity. A list of the equipment ordered will be found in appendices, classified according to the type of test they are used for, with a note of Chinese origin about the role of the Centre, an organization chart of the Centre, an overall plan, and photos taken during the training period and the missions.

---

(1) *In French* : "Centre National du Machinisme Agricole, du Génie Rural, des Eaux et des Forêts",

which can be translated tentatively into : "National Center for Agricultural Machinery, Rural Engineering, Water and Forestry".

(2) *United Nations Industrial Development Organization.*

Project for the China Agricultural Machinery Testing Centre  
UNDP Project DP/CPR/80/017 UNIDO Contract T 81/23

Missions to China by Mr JANIN Jean-Louis  
(August 7 to 14, 1981 ; July 8 to 29 and October 24 to 28, 1983)

Report by the consultants' team leader

CONTENTS

Introduction : defining the work to be done by the  
CEMAGREF in agreement with United Nations staff and the  
Chinese Authorities

1. - Ordering and sending the equipment to China
2. - The Chinese candidates Training Programme in France
3. - Missions to Beijing by the consultants from the CEMAGREF and  
their assistants

Conclusion.

Appendixes

- I -Project document (copy of page 1)
- II -Detailed list of test equipment purchased and other related  
expenditures
- III -Training programme of Mr. XIE, Mr. WANG and Mr. LI
- IV -"How to serve the Users and Industry"
- V -List of Agricultural Machinery-Testing and Evaluation Stations
- VI -Organization chart of the Centre
- VII -Plan of the Centre
- VIII -Photos

INTRODUCTION : defining the work to be done by the CEMAGREF in agreement with the United Nations staff and the Chinese Authorities

After an agreement had been reached on a project document (1) signed in Beijing in December 1980 by the Chinese Authorities and the representatives of U.N.D.P. and U.N.I.D.O. in Beijing (2), the CEMAGREF answered in February 1981 to an international call for tenders launched by the U.N.I.D.O. in Vienna and derived from the project document, in view of the following :

- . Ordering and sending equipment to China within the limit of 450 000 US dollars
- . Education of 4 Chinese trainees abroad (6 months each)
- . Missions of 5 consultants to China (one month each)

It was arranged during a meeting in Vienna on June 22, 1981, in order to make explicit the contract proposed by U.N.I.D.O. to the CEMAGREF, that a preliminary mission to Beijing by 2 consultants (Mr. JANIN and Mr. PICKER) and one representative of U.N.I.D.O. (Mr. ROSS) should take place in order to list the equipment to be purchased, the educational programme of the trainees and a description of the consultant's job.

The mission took place from 7 to 14 August, 1981 without coming to a definitive conclusion, the agreement of the Chinese Authorities on the work to be done by the CEMAGREF depending on the conclusions made after the study tour by a Chinese delegation in Europe, headed by the Project Director (Mr. GUO REN), paid by the project and planned in October and November 1981.

Nevertheless the preliminary mission to Beijing allowed the participants to open technical conversations which carried on in Antony during the two visits of the Chinese delegation in October and November, at the beginning and at the end of the study tour in Europe (France, United-Kingdom, Federal Republic of Germany, Sweden and Yugoslavia).

The CEMAGREF could therefore prepare supplementary documents which were discussed and signed at the head-quarters of U.N.I.D.O. in Vienna on November 12 and 13, 1981 :

- . Provisional list of test equipment
- . Provisional training programme ( 3 trainees)
- . Consultants' list

./.

---

(1) *The full name of the project is : Agricultural Machinery Testing Center and Technical Service to Industry. A shorter name for the project is used here : China Agricultural Machinery Testing Centre.*

(2) *U.N.D.P. : United Nations Development Programme  
U.N.I.D.O. : United Nations Development Organization*



The Chinese delegation requested that the training course and the consultant's mission on rice cultivation equipment should be confined to a Japanese Institute on Agricultural Machinery ; the U.N.I.D.O.'s staff at first asked the CEMAGREF to subcontract this task already planned for in its contract. This idea was to be abandoned later on for administrative reasons. The CEMAGREF was not in a position to approach the Japanese Governmental Authorities ; otherwise this would have let the Director of the Institute (Mr. KANATSU) to give a favorable answer to the request which was sent to him directly in December 1981. The principle of a direct request to the Institute by the U.N.D.P. in Beijing and the U.N.I.D.O. in Vienna was finally adopted, including a technical consultation of the CEMAGREF by the U.N.I.D.O. when requested.

The official agreement of the Chinese Authorities and the United Nations staff (including the U.N.D.P. office in Beijing) on the documents prepared in Vienna in November 1981 allowed the CEMAGREF to start to carry out its contract shortly before the end of the year 1981.

### 1.- ORDERING AND SENDING THE EQUIPMENT TO CHINA

The orders were prepared and placed by the consultants' team leader with other members' help in their respective areas of responsibility (bench testing, field testing, electronics and computer systems).

The main orders were placed during the first months of 1982 on the basis of the suppliers selected by the Chinese delegation in Vienna taking into consideration the consultations made by the CEMAGREF in October 1981.

The other orders, whose suppliers were left to the free choice of the CEMAGREF, were placed during 1982, following the completion of the design of certain test benches, the result of the consultations made amongst the suppliers and also following the result of discussions carried out with the Project Director partly through the U.N.I.D.O.'s staff but mostly the U.N.D.P. office in Beijing so as to classify the elements to be supplied in a priority order and to place them within the limits of 450,000 US dollars, stated in the contract and the project document.

All the orders were placed by the CEMAGREF at fixed prices. Payments by U.N.I.D.O. were made on the basis of invoices in French Francs (with their equivalent in US dollars) presented by the CEMAGREF which could be assimilated to Pro-Forma invoices in as much as they reflected its commitments resulting from the pro-forma invoices presented by the suppliers, onto which 7 % was added for management costs.

This procedure of pre-payment by U.N.I.D.O. was imposed on the CEMAGREF, because of its statute (1) for the purchasing of equipment included in its contract (which payment was to be made out under the formula C.I.F.(2) in the port of Beijing).  
./.

---

(1) *Public establishment with an administrative statute*

(2) *Cost Insurance and Freight*

This allowed the CEMAGREF to avoid any financial commitment of an administrative establishment which might have been risked owing to the dollar's fluctuations.

In consequence it demanded a permanent follow-up (in dollars and in French Francs) of the sums that were effectively paid out to the CEMAGREF (according to the dollar's rate of exchange on the day of payment) and (in Francs) of the orders that were effectively made by the CEMAGREF. This way of working allowed the project to benefit from the dollar's increased rate of exchange during 1982 for orders not yet placed at the beginning of the same year (transport included). The sole element of doubt tied to the fluctuations of the exchange rate was the cost of sea-freight estimated in dollars and billed in francs at the rate of dollar's cost price on the day the containers were embarked.

The total sum of payments received by the CEMAGREF to this day ( March) 1984) on the grounds of the ordering and the dispatching of the equipment to China amounts to 2,596,655 francs corresponding to 448,790 US dollars. The last bill of 9,545 francs has been presented in September 1983, after the agreement by the U.N.I.D.O. on the overall sum of 2,606,201 francs (transport included) for the CEMAGREF expenditures on equipment purchase and delivery. If this bill, which has not yet been paid, is added to this total -and supposing the United Nations exchange rate to be 8 francs to the dollar on the day of payment -a general total of 449,983 US dollars is obtained. (corresponding to 2,606,201 francs), that is to say an average rate of exchange of 5,7918 francs to the dollar for the whole order.

A detailed list of the expenditures made by the CEMAGREF on equipment purchase and delivery will be found in the appendices, derived from the list made on November 11, 1981 and completed on January 28, 1983 which was agreed upon by the U.N.I.D.O. before the expedition of the equipment to China. A shorter version of this list is presented here :

#### Summary of equipment cost and other expenditures

	French francs (tax free)	US dollars (5,7918F/dollar)	% of total cost
<i>I - Testing of tractors, motors and walking tractors</i>			
a) Testing of motors and of tractors at power take-off	1,299,320.00	224,339	50
b) Testing of the hydraulic lift system of tractors	27,727.00	4,787	1
c) Testing of walking tractors	60,983.00	10,529	2
d) Testing of noise level and braking of tractors	49,228.00	8,500	2
<i>Total I</i>	<i>1,437,258.00</i>	<i>248,155</i>	<i>55</i>

	French francs (tax free)	US dollars (5,7918F/dollar)	% of total cost
<i>II - Field testing of tractors with cultivating equipment</i>			
a) Sensors, amplifiers and dynamometric bar for field measurements	138,647.00	23,938	5
b) Soil measurements	16,515.00	2,851	0,6
c) Working time measurements	8,792.00	1,518	0,3
d) Telemetry equipment	350,000.00	60,430	13
<i>Total II</i>	<u>513,954.00</u>	<u>88,738</u>	<u>20</u>
<i>III - Data processing</i>			
<i>Total III</i>	334,404.00	57,738	13
<i>Total I + II + III</i>	2,285,616.00	394,631	88
<i>IV - Other expenditures</i>			
a) Management cost (7 % of equipment cost)	159,993.00	27,624	6
b) Transport (limited to ocean freight)	82,041.00	14,165	3
c) Assistance for equipment installation and reception (Schenck)	78,551.00	13,562	3
<i>Total IV</i>	<u>320,585.00</u>	<u>55,352</u>	<u>12</u>
<i>Total I + II + III + IV</i>	<u>2,606,201.00</u>	<u>449,983</u>	<u>100</u>

The equipment was delivered at Antony from July 1982 onward and a certain amount was tested on the spot (telemetric devices, computer equipment, brake lifting devices, dynamometric bar ...) then packed in crates to be transported by sea. The crates were put in 2 twenty foot containers and left Antony on the 7th April 1983. The containers were put into position at Antwerp on vessel Xiamen belonging to the CUSCO (China Ocean Shipping Company). The port of embarkation and the shipping company were imposed on the forwarding agent chosen by the CEMAGREF (S.C.T.T. = Société Commerciale de Transport Transatlantique, Paris) in compliance with the Chinese Authorities' request to the P.N.U.D. office in Beijing. The ship docked at Xingang at the end of May. The containers were opened at the docks for custom clearance and the crates were delivered by lorry to the Beijing Centre by a forwarding agent commissioned by the Centre's authorities. The crates were delivered (apart from two which had been delayed by custom clearance in France and had been sent out by plane, arriving before the containers) on the 1st July, that is to say a few days before the arrival of Mrs KLEMAN and Mr. JANIN at Beijing (see the 3rd part of this report).

## 2.- THE CHINESE CANDIDATES TRAINING PROGRAMME IN FRANCE

The Chinese authorities made their choice of trainees after their study tour in Europe. Mr. XIE YANMOU, Mr. WANG YUANXIANG and Mr. LI XIJIAN were selected to come to the CEMAGREF (Mr. WANG LIANSHEN had already been chosen for the training course on rice cultivation equipment. His training course in Japan had been delayed as a result of the above mentioned administrative difficulties. It took place at the Japanese Institute of Agricultural Machinery at Omiya-Shi, near Tokyo, from July to December 1983).

In order to facilitate the progress of the courses of technical instruction lasting 6 months, and although this provision had not been foreseen in the document drawing up the project, it was possible to integrate the trainees in a group language course organized in France for 6 months with the kind help of the ACTIM (1) the services of which are represented amongst the divers services of the French Embassy at Beijing.

The language course took place in Paris from February to July 1982, comporting many visits of a technical or cultural character. The technical courses took place in Antony from August 1982 to January 1983. During their stay in France the trainees lived in the University Residence of Fontenay-aux-Roses (ACTIM pavillion). The technical themes dealt with during the 3 trainees according to the assignments of each of the 3 specialized consultants in the preparation of the equipment order and the scheduled missions in Beijing. Thus Mr. WANG worked primarily with Mr. BOUHAGEB on testing tractors on the bench, Mr. XIE with Mr. BILLOT on testing in the field and Mr. LI with Mr. MECHINEAU on the utilisation of computerized systems and telemetry equipment. However taking into account the connections between the different themes and the common language problem, solved for the most part by the helpful contribution of Mr. LI, a certain amount of inter-penetration was sought for in the courses. The 3 trainees could thus follow official tests on the tractors' P.t.O. and the campaign organized in January 1983 on an agricultural estate in the Parisian area to demonstrate the possibilities of telemetric operations with the help of the French manufacturers. Their equipment was lent just in time to be able to create at the CEMAGREF an apparatus complete with captors allowing the simultaneous utilisation of the 16 telemetric canals for transmitting untreated data (Renault Company - Agricultural Department : a tractor with both back and front hydraulic lift systems ; Huart Company : back and front ploughs).

The chronological order of the distribution between the trainees of the technical themes that were allotted to them will be found in an appendix and was submitted to them - together with documents - and to the Chinese authorities for any remarks before the outset of the training course.

All in all, the suggested programme was effectively followed through.

The short length of time of the technical courses, the diversity of the subjects treated plus the language problem did not allow the trainees

./.

---

(1) Agence pour la coopération technique industrielle et économique.

to carry out any individual research on a given subject. However the sizeable quantity of the work undertaken and the undiminished efforts brought to bear by the trainees on the different manipulations carried out by them themselves or in their presence in the laboratory or in the field, allows one to feel that their initiation in the measurements and trials that they were able to follow was not superficial. The choice of a 6 months long course seems therefore sufficient for trainees with adequate motivations and working as a team.

Even if the solution proposed for the language problem was not entirely satisfactory it can be considered that it was the best possible given the circumstances, as the project document did not make any mention of this point. A preliminary knowledge of the French language, acquired in China during school years or as an accelerated course would have been preferable but probably would not have changed the programme of the training courses in any fundamental way, as they were axed on technical initiation.

The use of English during the courses, which was suggested by some specialists of the U.N.I.D.O. at the preliminary discussion in Vienna in June 1981 was impracticable taking into account the low level of trainees' ability and the very small number of representatives with whom the trainees were in daily contact who could have spoken or understood English adequately.

Following the request of the Chinese authorities Mr. XIE was able to make a 3 weeks' visit from August 16 to September 4 to the D.L.G. testing station (1) at Gross Umstadt near Francfort in Western Germany, thanks to the kindness of Mr. FREIDANK, the station's manager, and with the help of the ACTIM for the organization of the visit.

Following a proposal made by the CEMAGREF, the Chinese authorities and the United Nations services accepted moreover to include in the contract a fortnight's visit to the Schenck Company, manufacturer of the tractors braking force at the P.t.O., by Mr. XIE, Mr. LI and Mr BOUHAGEB from 26 September to 8 October 1982 (Running and maintenance of brakes using Foucault currents and their control racks). The necessary explanations during the visit were given in French by a representative of the Schenck Company in France.

In spite of the language problem the trainees wrote an account of their technical course before leaving Antony.

### 3.- MISSIONS TO BEIJING BY THE CEMAGREF CONSULTANTS AND THEIR ASSISTANTS

The nature of the contract - a combination of the purchasing of equipment plus a training course in its use both in France and in China - demanded that the consultants missions to Beijing take place in complete security as to the accomplishment of the task of equipping the test cells (water cooling and exhaust gas outlet apparatus) and the effective delivery of the imported

./.

---

(1) Deutsche Landwirtschaft Gesellschaft

equipment. Since the CEMAGREF was not in itself the manufacturer of this equipment - with the exception of the lifting systems to be installed under 2 of the 3 brakes - it was necessary to ensure that this implementation gave no problem and that the setting up of the 3 brakes was done under conditions similar to those practised currently in Industry in Europe, i.e. acceptance tests being done on the site in presence of a technician representing the manufacturer, before carrying out the demonstration testing works by the specialized consultant.

The original document concerning the project giving no precision as to the reception of the installations or the equipment on the site, these were not included in the contract drawn up between the U.N.I.D.O. and the CEMAGREF (delivery of equipment, C.I.F. (1) at the port of Beijing). It was however decided to include in the supply contract of the largest quantity of equipment drawn up with the Schenck Company (the 3 brakes with their control racks) two provisions of aid to the CEMAGREF consultants :

- one provision for an inspecting engineer to ensure the verification on plans of the equipment of the test cells (dealt with by correspondence during 1982 and at the beginning of 1983) as well as the verification on the spot of the equipment delivered and the finishing of the test cells including help on the setting up of the brake lifting devices

- one provision for the reception and the implementation of the Schenck Company's equipment by one of the Company's engineers who would moreover be able to initiate the Centre's technical team in the maintenance operations.

The part of the first provision which was to take place at Beijing had been agreed upon in the form of a 10 day's mission to China by a specialist from the SESSIA (2), a company acting on behalf of the Schenck Company which was accepted by the CEMAGREF because of their experience in the design and the installation of equipment of this type in France and in Africa. Mrs. KLEMAN'S mission took place during the first two weeks of Mr. JANIN'S first mission (see below the résumé of the consultants' missions).

The second provision had been agreed upon in the form of a 3 weeks' mission to China by an assembling engineer from the Schenck Company's factory in Western Germany. Mr. MAIBAUM'S mission took place during the first 3 weeks of Mr. BOUHAGEB'S mission.

A certain amount of delay was foreseen between the end of the inspecting engineer's mission and the start of the assembling engineer's one in order to let the Centre finish the installation and the connection of the test equipment in the test-cells before starting them up, and if the occasion should arise, carry out any tasks that proved necessary.

The 3 consultants' missions had been staggered in the same way so as to facilitate the linking up of the tests at the bench with the field tests using the telemetric equipment, so as to include a period of equipping Chinese made agricultural equipment with sensors provided with the equipment delivered to the Centre and the apprenticeship in the technique of primary data

---

(1) *Cost-Insurance-Freight*

(2) *SESSIA : Société d'Etudes de Constructions et de Services pour Souffleries et Installations Aérodynamiques.*

processing of the telemetric recordings on the electronic computer.

The choice of 6 weeks delay between the missions of inspection and equipment acceptance by Mr. JANIN and Mr. BOUHAGEB aided respectively by Mrs. KLEMAN and Mr. MAIBAUM, and of 7 weeks staggering of the 3 missions by Mr. BOUHAGEB, Mr. MECHINEAU and Mr. BILLOT turned out to be correct and allowed the three specialized consultants to carry out together a certain number of tasks as is usually the case in a testing programme of this type.

A chronological résumé of the whole set of missions between 8 July and 28 October 1983 will be found below.

8-22 July (Mrs. KLEMAN and Mr. JANIN)

Opening the crates ; testing the brakes' water distribution and exhaust gas extraction systems ; assistance in sealing of brake lifting systems (W 400 and W 700) ; visit to the tractor plant of Tian-Jin (Mr. JANIN) ; 1 seminar by Mrs. KLEMAN ; 5 seminars by Mr. JANIN ; meetings at the Centre and at the P.N.U.D.'s office.

25-29 July (Mr. JANIN)

3 seminars ; various contacts ; project evaluation meeting.

5-9 September (Mr. BOUHAGEB and Mr. MAIBAUM)

Calibration of the brakes W 400 and W 700 and preliminary test of the tractor Shanghai 50.

12-24 September (Mr. BOUHAGEB, Mr. MAIBAUM and Mr. MECHINEAU)

P.t.O. test of the tractor Shanghai 50 (on W 700) ; calibration of the brake W 70 with the motor of the Shanghai 50 (after putting it out of balance) ; test of the tractor Tieniu 65 of the Centre on W 400 ; 2 seminars by Mr. BOUHAGEB ; installation and putting into working order of the calculator HP 9845 with its peripheral equipment and of the telemetric equipment with its interface from the CEMAGREF. Test of the tractor Tieniu 80 on W 700 with plotting of the curves ; 3 seminars by Mr. BOUHAGEB (including 1 with Mr. MAIBAUM's assistance) ; various tests (freinograph, sonometer, smoke-meters) ; 2 seminars by Mr. MECHINEAU ; visit to the Beijing motor plant and the Academy of the Agricultural Mechanization Sciences (with Mr. BILLOT).

26-30 September (Mr. BOUHAGEB, Mr. MECHINEAU and Mr. BILLOT)

Test of the tractor Fiat 1300 DT on W 700 and the motor 495 A of the tractor Shanghai 50 on W 400 ; test of the Tractor Tieniu 65 (new model) on W 400 ; operation of the fuel consumption weighing unit ; sensors' installation and field test of the rotavator IGN 200 fitted to the Tieniu 65 of the Centre, using the telemetric equipment.

4-8 October (Mr. MECHINEAU and Mr. BILLOT)

2 seminars by Mr. MECHINEAU ; data processing of the field test ; operation of the voltmeter HP 6940 ; operation tests of the multichronometer and the dynamometric hitch bar with the TS 106 converter from SEDEME (1) ; 1 seminar by Mr. BILLOT ; visit to the Suan Tchiao state farm (Mr. BILLOT).

(1) Société Européenne de Distribution, Engineering, Maintenance Electronique

10-21 October (Mr. BILLOT)

Demonstration of the soil characteristics measuring equipment (for the participants to the seminars) ; detailed demonstration of the utilisation of the TS 106 converter, of the torque-meter (with calibration), of the fuel consumption meter and of the dynamometric hitch bar (for the technical staff of the Centre) ; 3 seminars ; assistance to the data processing of the field test.

24-28 October (Mr. JANIN)

Visit to the Centre with a demonstration of the bench and field tests already carried out, at the same time as an official delegation of the Ministry of Agriculture and the Ministry of Machine Building ; visit to the Beijing Institute of Agricultural Mechanization; meetings at the Centre and at the P.N.U.D.'s office.

Much restraint was necessary in the elaboration of this missions' programme. It was established and safely carried out thanks to the diligence of the authorities and the technical staff of the Centre and, we hope, the consultants, everybody knowing perfectly well the danger which any failure or misunderstanding on either side would have represented for the happy sequence of operations.

The consultants' missions represented another face of the training course carried out at Antony and, for a shorter period, a total availability of the consultants and of their assistants, the help brought by the trainees to the technical staff of the Centre and the participation at the seminars of a very large audience coming from outside the Centre.

In the reports of the 3 specialized consultants will be found detailed indications on the work carried out together with remarks and recommendations which have been formulated in agreement with the team leader.

For my first mission as team leader I was charged with introducing the topics which were to be treated later on during the seminars together with the tests that were to be carried out.

This was done at first through an introductory seminar lasting one day which was devoted to a general presentation of the CEMAGREF's activity, stressing the testing and research activity in Agricultural Machinery and the research and technical work being done in Agricultural Engineering and Hydraulics (irrigation, field drainage, hydraulic works ...).

The other 4 technical seminars lasted one day each and were concerned with tractor testing and tractor performance :

1. Interest of P.t.O. tractor testing ; analysis of fuel consumption.
2. Notions of optimal and sub-optimal slip on tractors.
3. A new method testing the power at the wheel's axle ; modeling the track and field performances of tractors
4. Regulation and safety tests in France and in Europe ; tractor control on the farm with a mobile laboratory.



At the Centre's authorities request 3 seminars were given during the last week on the mechanization of sprinkler irrigation, the presentation of which was widely drawn from an important book published in 1980 by the United Nations Food and Agriculture Organization (1) :

1. The different methods of sprinkler irrigation mechanization
2. The main mechanized irrigation systems
3. The testing of irrigation machines ; research and technical work related to their development

My mission from 8 to 29 July was also an occasion to establish a contact on the project between Mr. SISSINGH, S.I.D.F.A. (2), from the U.N.D.P. office in Beijing, who has been closely associated with the project from its very beginning and Mr. J.C. BOUVIER, Programme officer of the Beijing office of the F.A.O., both of whom attended the intermediate project evaluation meeting which was held in the Centre at the end of the mission. Thanks to kindness of Mr. TU BINGHENG, this mission allowed me also to meet several Chinese specialists whose responsibilities lay in the field of Agricultural Mechanization and Rural Development, namely Mr. WANG WANGJUN (Vice-President of the Academy of the Agricultural Mechanization Sciences) and Mr. TAO DINGLAI (Director of the Academy of Agricultural Engineering) as well as Mr. GAO RUSHAN from the Ministry of Electricity and Water Conservancy and Professor CHEN BINGONG from the Jilin University at Changchun.

This mission allowed me also to visit the tractor plant of Tian Jin and to meet its director Mr. CHEN DUAZOU and also to make another visit to the Academy of Agricultural Mechanization Sciences, following the visit made in August 1981.

The second mission was planned from 21 to 28 October and took place from 24 to 28 October because of my participation in the U.N.I.D.O.'s Second Consultation on Agricultural Machinery which was held in Vienna (Austria) from 17 to 21 October. The visit to the Beijing University Institute of Agricultural Mechanization which was organized by Mr. TU BINGHENG was the occasion for meeting its technical staff and its Vice Président, Mr. ZENG DECHAO

This second mission was the occasion to check, through the meetings with the technical staff and the demonstrations carried out in the Centre and outside, that the programme established in July for the Consultants missions had been successfully carried out.

./.

---

(1) *La mécanisation de l'irrigation par aspersion, par L. ROLLAND, Directeur du Groupement de Bordeaux du CEMAGREF*

(F.A.O., *Irrigation and Drainage Bulletin*, n° 35 ; 465 pages, 373 figures 65 tables ; Rome 1980)

*I prepared an English version of this book that has been published by the F.A.O. in 1982 under the title of : Mechanized Sprinkler Irrigation, and is presently being used for its translation into Chinese*

(2) *Senior Industrial Field Advisor*

## CONCLUSION

It is difficult to come to a conclusion on such a dense set of informations collected, reflexions and exchanges which - we hope - characterized the implementation of the contract between the U.N.I.D.O. and the CEMAGREF, in order to carry out the project decided on in 1980 between the Chinese Governmental Authorities and the representatives of the United Nations Organizations in Beijing.

The technical activity of the Agricultural Machinery Testing Center and Technical Service to Industry will go far beyond the phases of preliminary discussions, test equipment ordering and initiation in its use in France and in China, which took place from June 1981 to October 1983.

This activity has the twofold ambition to serve the farmers, as users, and the Chinese Industry of Agricultural Machinery through equipment testing and evaluation work which are described in a note written by the Chinese authorities of the Centre and enclosed in this report ("*How to serve the users and industry?*"). One will find at the end of Mr. BILLOT's report a few remarks on this point.

The equipment which is now available in the Centre should enable it to develop its activity in three directions reflected by its organization in 3 technical divisions : testing of tractors and motors - including walking tractors, evaluation of tools and machines, instrumentation (see the Centre's organization in appendix).

It seems to us that this actions will reach its full value only if it is possible to harmonize the choice of the equipment to be tested and the testing and evaluation methods with the activity developed by the 27 Agricultural Machinery Testing and Evaluation Stations in 21 Provinces, 2 municipalities (Beijing and Tianjin) and 3 Autonomous Regions (1). A first evidence of this was given through the participation of representatives of these stations in the seminars presented by the consultants in 1983.

The setting up of mobile laboratories or equivalent equipment allowing one to reproduce locally some of the tests carried out in the Beijing Centre (for example the test of the tractors at the power-take-off) and possibly the duplication of a few test benches (hydraulic lift, walking tractors ...) and simple measuring equipment (fuel consumption meters, torque-meters, dynamometric hitch bars ...) could facilitate the integration of the new means and methods to be developed in the Stations already mentioned and - why not ? - in the Manufacturing Plants and the University Colleges or Academy Institutes which are close to them, as well as in the schools of Technicians in Agricultural Machinery.

The Centre's vitality will be based also on research and development works in the technology of testing and evaluation of tractors and agricultural machines which will be undertaken in connection with existing Academies such as the Academy of the Agricultural Mechanization Sciences, and University Colleges such as the Beijing Institute of Agricultural Mechanization. ./.

---

(1) *There are two stations in Heilongjiang: one for the Province and one for the State Farm General Bureau*

We will mention as examples the measurement of mechanical stress in machines during their operation, the recording of working times of the critical operations of an agricultural campaign and the various modeling techniques within the scope of industrial engineering or economic analysis.

Tests and research works on irrigation and agricultural drainage equipment (including the pumps) have also their part in the services to be brought to agriculture in irrigated areas or in areas protected against flooding and the upsurging of infiltrated water. It seems reasonable that the Centre should find its equivalent or its extension in the domain of this equipment where it is most widely used or where the use of new equipment is foreseen, in connection with the authorities responsible for collective hydraulic works.

In any case I think that the Centre will have an original place in the means developed in China to serve the users and the industry of agricultural machinery and that the work carried out during almost 3 years in excellent conditions of cooperation with our Chinese partners and the assistance of the United Nations Services will bear its fruits and legitimate the hopes set on the project.

To conclude I would like to express our thanks here for the help that we received during this task carried out together with the authorities and the staff of the United Nations Services in Vienna and Beijing whom we met, particularly Mr. Harold ROSS with whom we made the preliminary mission, and Mr. SISSINGH who covered the entire operation in Beijing. Without having unfortunately the possibility to name all our Chinese partners I would still like to express our thanks to them here, and particularly to Mr. GUO REN, Project Director, and Mr. TRAN HUIMIN, Director of the Centre, for their confidence in us and to Mr. TU BINGHENG Chief Engineer, for his wide understanding and his efficient and untiring help during the whole operation. We wish all success in their enterprise to the authorities and the technicians of the Centre whom we met during the missions and particularly to the trainees who came to France (Mr. XIE YANMEN, Mr. WANG YUANXIANG and Mr. LI XIJIAN) and who put their knowledge at the service of the project.

Appendix I Project document (copy of page 1)  
(document received from the Project Director in August 1981)

-----

UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP)  
Project of the Government of the People's Republic of China

Project Document

Title: Agricultural Machinery Testing Center  
and Technical Service to Industry

Number: CPR/80/017/A/01/37

Duration: One year and a half

Primary Function: Institution Building

Secondary Function: Direct Support

Sector (Govt. class): Agricultural Machinery  
(UNDP class + Code): Industrial Development Support Service  
(0510)

Government Implementing Agency: Ministry of Agricultural Machinery

Executing Agency: United Nations Industrial Development  
Organization

Date of Submission: 8 July 1980

Estimated Starting Date: Jan. 1981  
(Month and Year)

Government's Inputs: R.M.B. Yuan 4.45 million (in kind)

UNDP Inputs: U.S. Dollar 700,000

Government's Cost Sharing: NIL  
(US Dollars or other freely convertible  
currency)

Signed 陈典农  
On behalf of the Government

Date 1980.12.15

Signed Handwritten Signature  
On behalf of the Executing  
Agency (UNIDO)

Date 29 Dec 1980

Signed Handwritten Signature  
On behalf of the United  
Nations Development Programme  
(UNDP)

Date 29 Dec. 1980

APPENDIX II : Detailed list of equipment purchased and other related expenditures (1)  
(amounts in French Francs)

<u>I.- TESTING AT THE CENTRE OF TRACTORS, MOTORS AND WALKING TRACTORS (to carry out in priority)</u>	1,437,258.00
a) <u>Testing of motors and tractors at the power-take-off</u>	1,299,320.00
1) Brake W 700 with accessories	450,330.00
2) Brake W 400 with accessories	319,100.00
5) 1 motor pillow block on W 400	25,750.00
3) Brake W 70 with accessories	215,230.00
1-3) Supplementary spare parts	<u>11,039.00</u>
Total 1, 2, 3, 5, except 2A, (Schenck)	1,021,449.00 (2)
2A) Fuel balance on W 400 (S 3 EP)	45,825.00
4A) Temperature measurement (Difetec)	58,548.00
4) 3 data processors (S3 EP : 135,450.00)	not ordered
6) 2 brake lifting devices (CEMAGREF)	153,290.00
including :	
- motor (CEM) : 2,624.00	
- Screw-jacks (Fogex) : 36,014.00	
7) 1 smokemeter (Bosch)	<u>20,208.00</u>
Total Ia	1,299,320.00

./.

---

(1) See the provisional list of test equipment dated 11 november 1981 and agreed upon at the U.N.I.D.O. Centre in Vienna

See also the list of orders placed for test equipment (CEMAGREF situation as of 5 January, completed on 28/01/1983)

(2) The sole CEMAGREF order to Schenck amounted to 1,100,000.00 including the aid for installation and reception of the brakes (78,551.00) the exact amount of which could be decided only after knowing the exact value of the supplementary spare parts (11,030.00). This last amount was approximately split between the 3 brakes in the list of orders completed on 28/01/1983.

b) Testing of the hydraulic lift system of tractors 27,727.00

8) Measuring and hydraulic equipment

Hydraulic jacks (Matairco)	4,162.00
Hydraulic accumulator (Olaert)	4,691.00
Special pulley (Corderie)	1,600.00
Sensors (Sedeme)	12,414.00
Dial-gauges (A.O.I.P.)	4,860.00

*Total Ib* 27,727.00

Pressure and flow measurement not ordered  
(Tem-Equip : 38,783.00)

c) Testing of walking tractors 60,983.00

9) Measuring and hydraulic equipment

Flow dividers (Doedjins)	2,148.00
Filter (Sofrance)	2,095.00
Hydraulic motor (Danfra)	7,026.00
Screw distributor (Atos hydr)	2,000.00
Divider and pump (Hydroperfect)	5,475.00
Motor (Leroy-Somer)	2,195.00
Speed-variator (Texrope)	6,509.00
Micro-filter (Sofralub)	944.00
Pressure-limiter (Rexroth)	11,521.00
Dynamometer (Sedence)	7,700.00
Tachometer (Chauvin Arnoux)	3,870.00
Dial-gauges (A.O.I.P.)	9,500.00

*Total Ic* 60,983.00

d) Tractor testing on the track (Noise and braking) 49,228.00

10) Sonometer (Bruel et Kjaer)	45,294.00
11) Measuring equipment for a small trailer used for braking tests	item cancelled
12) Breaking measurements (Nauder)	3,934.00

*Total Id* 49,228.00

IA Other tests of single tractors at the station or on the user's farm (depending available funds) -

e) Outdoor testing of single tractors on the user's farm -

13) Equipment of a mobile laboratory	not estimated
14) Small mobile brake (Opico : 48,800.00)	not ordered

f) Testing of vibrations on tractor seats -

15) Vibration measuring equipment	not estimated
-----------------------------------	---------------

II.- <u>FIELD TESTING OF TRACTORS WITH CULTIVATING EQUIPMENT</u> (to carry out in priority)		513,954.00
a) <u>Sensors amplifiers and dynamometric bar for field measurement</u>		138,647.00
16) Fuel consumption meter (Emerson)	8,090.00	
17) Forward speed meter, radar (RDS)	2,446.00	
18) P.t.G. rotation speed	7,517.00	
Proximity sensor (Rogo)	5,231.00	
Chronoscope (Acir)	2,286.00	
	7,517.00	
19) Torquemeter (Johne + Reilhofer)	40,000.00	
20) Measuring the traction forces on the linkage device	80,594.00	
Sensors and amplifiers (Sedeme I + II)	36,280.00	
Dynamometric bar (CEMAGREF)	34,314.00	
Gauge adhesion (J.A.)	4,500.00	
	5,500.00	
Total	80,594.00	
Total II a		138,647.00
b) <u>Soil characteristics measuring equipment</u>		16,515.00
21-22) Penetrometer and soil moisture measurement device (Sattec)	16,515.00	
c) <u>Working time measurements</u>		8,792.00
23) Multi-chronometer (Kienzle)	8,792.00	
d) <u>Telemetry equipment</u>		350,000.00
23 A) Telemetry equipment, PCM type, with emission, reception, conversion and recording (Johne + Reilhofer)	350,000.00	
IIA <u>Other field tests of tractors with cultivating equipment (depending on available funds)</u>		-
24) Torque measurements on the driving wheel axle	not estimated	
25) Other measurements (pressure, temperature, acceleration)	not estimated	
III.- <u>DATA PROCESSING WITH MICRO-COMPUTER</u> (to carry out in priority)		334,404.00
26) Micro-computer model HP 9845 including plotter, printer and floppy disks unit (Hewlett-Packard)	334,404.00	

IV.- <u>OTHER EXPENDITURES</u>	320,585.00
a) Management cost (7 % of equipment cost, Total I + II + III : 2,285,616.00)	159,993.00
b) Transport, sea freight (S.C.T.T.)	82,041.00
c) Aid for equipment installation and reception (Sessia and Schenck)	78,551.00
	<hr/>
TOTAL I + II + III + IV	2,606,201.000



**APPENDIX III : Training programme of Mr. WANG, Mr. XIE and Mr. LI**  
*(Scheduled in June 1982 and carried out with a few changes)*

	<i>item number (1)</i>
<b>• Mr. WANG (Training programme n° 1)</b>	
Tractor testing at the power-take-off : 9 weeks (2.8 - 8.10.82)	1.1
Testing of the hydraulic lift system : 3 weeks (11.10 - 29.10.82)	1.2
Noise and brake testing : 5 weeks (1.11 - 3.12.82)	1.4
Testing of safety cabs and seats : 4 weeks (6.12 - 31.12.82)	1.5 and 1.6
Mobile laboratory : 2 weeks (3.1 - 14.1.83)	1.3 (5)
Conclusion and report : 2 weeks (17.1 - 28.1.83)	-
<b>• Mr. LI (Training programme n° 2)</b>	
Tractor testing at the power take-off : 7 weeks (2.8 - 24.9.82)	1.1
Training at Schenck's plant in F.R.G. : 2 weeks (26.9 - 8.10.82)	1.1
Testing of the hydraulic lift system	1.2
Measurement of the moment of inertia	2.8
Telemetry and computer systems : 5 weeks (1.11 - 3.12.82)	3.2. (2)
Walking tractors : 4 weeks (6.12 - 31.12.82)	2.6
Mobile laboratory : 2 weeks (3.1 - 14.1.83)	1.3 (5)
Conclusions and report : 2 weeks (17.1 - 28.1.83)	-
<b>• Mr. XIE (Training programme n° 3)</b>	
Testing of combine harvesters : 2 weeks (2.8 - 13.8.82)	3.1
Visit to D.L.G. Station in F.R.G. : 3 weeks (16.8 - 4.9.82)	-
Testing of driveshaft guards : 2 weeks (6.9 - 17.9.82)	1.8 (3)
Tractor testing at the power-take-off : 1 week (20.9 - 24.9.82)	1.1 (4)
Training at Schenck's plant in F.R.G. : 2 weeks (26.9 - 8.10.82)	1.1
Testing of the hydraulic lift system : 1 week (11.10 - 15.10.82)	1.2 (4)
Field measurements : 8 weeks (16.10 - 3.12.82)	3.2 (5)
Testing of traction force and transmissions' losses : 4 weeks (6.12 - 31.12.82)	2.5 (6)
Mobile laboratory : 2 weeks (3.1 - 14.1.83)	1.3 (5)
Conclusions and report : 2 weeks (17.1 - 28.1.83)	-

(1) *Items listed in the 3 provisional programmes adopted in Vienna in November 12, 1981.*

(2) *Contribution to the training programme n° 3.*

(3) *Transferred from the training programme n° 1*

(4) *For the information of the trainee.*

(5) *Tillage. The field demonstration of the telemetry system was carried out with a large tractor (Renault 145-14) equipped with rear and front ploughs (Huard). It took place in January, replacing the demonstration of a new mobile laboratory still under construction at that date, and was followed by the 3 trainees.*

(6) *Transferred from the training programme n° 2.*

## APPENDIX IV : «HOW TO SERVE END USERS AND INDUSTRY»

*(Received from Mr Tu E'ingheng on May 24, 1983)*

In China, agricultural machinery product was formerly allocated and sold to different regions by the Government. After the implementation of the system of production responsibility in rural area, the individual farmers, peasant households and jointed peasant households have their preference and right to choose and purchase high grade agricultural machinery and implements. So the manufacturers should decide their production and marketing quotas according to orders and sales instead of Government allocation, and pay more attention to quality improvement of product. Therefore, evaluation appears to be an important measure to serve end users in selecting suitable agricultural machinery through testing, evaluation, demonstration and dissemination to adapt local measures and conditions on the one hand, and to serve industry by providing integrated appraisal of performance, safety, reliability, economy, and adaptability as well as comments on development and quality improvement of agricultural machinery product on the other hand.

The China Agricultural Machinery Testing Centre (CAMTC) and its 6 Regional-Centres and 26 Provincial, Municipal and Autonomous Regional Evaluation Stations form an evaluation network in China to play an important role in linking end users with industry.

In China, a new prototype and mass production product of agricultural machinery should pass the procedure of testing, evaluation and extension as follows :

1. Evaluation of research prototype;
2. Evaluation of trial product : After the evaluation of prototype, the model will be put into trial production in a factory and to be evaluated;
3. Extension Evaluation : After the mass production or small-scale trial production product has been used in different agricultural regions for a certain period, it should pass an extension evaluation to assess the adaptability of the machine with end users under practical operation;
4. Extension : A large-scale extension of agricultural machinery will take place after the extension evaluation. Several experimental units will be established in typical regions to carry out testing, demonstration and extension, as well as training farmers to handle the operation, maintenance and service of machinery;
5. Special Item Evaluation : To evaluate special item of mass production product, such as noise, environment pollution, etc.;
6. Spot-check Evaluation : To evaluate the product if it still keeps the quality of the original evaluation.

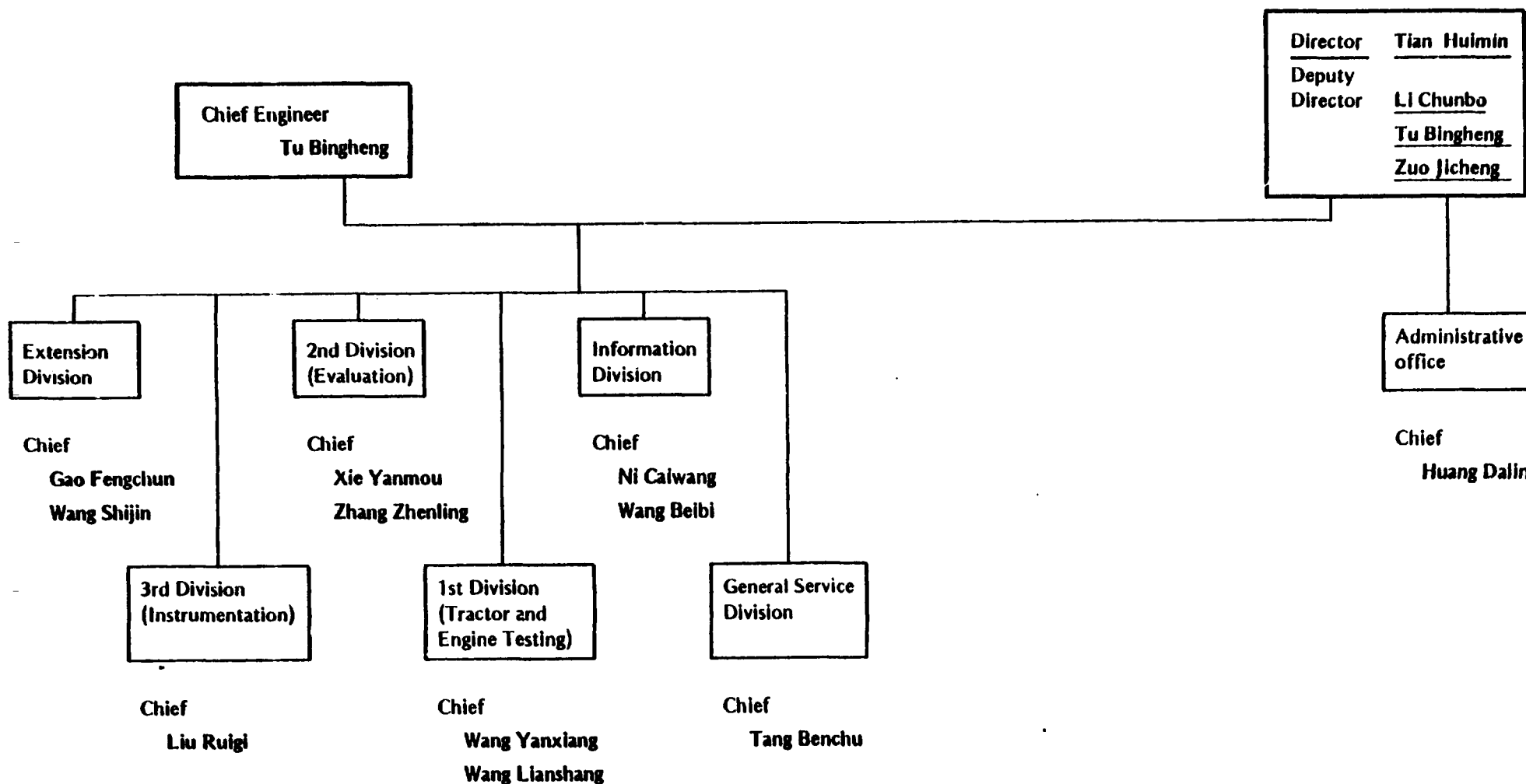
**APPENDIX V : (Document received from the Centre in October 1983)**

**LIST OF AGRICULTURAL MACHINERY  
TESTING AND EVALUATION STATIONS IN CHINA**

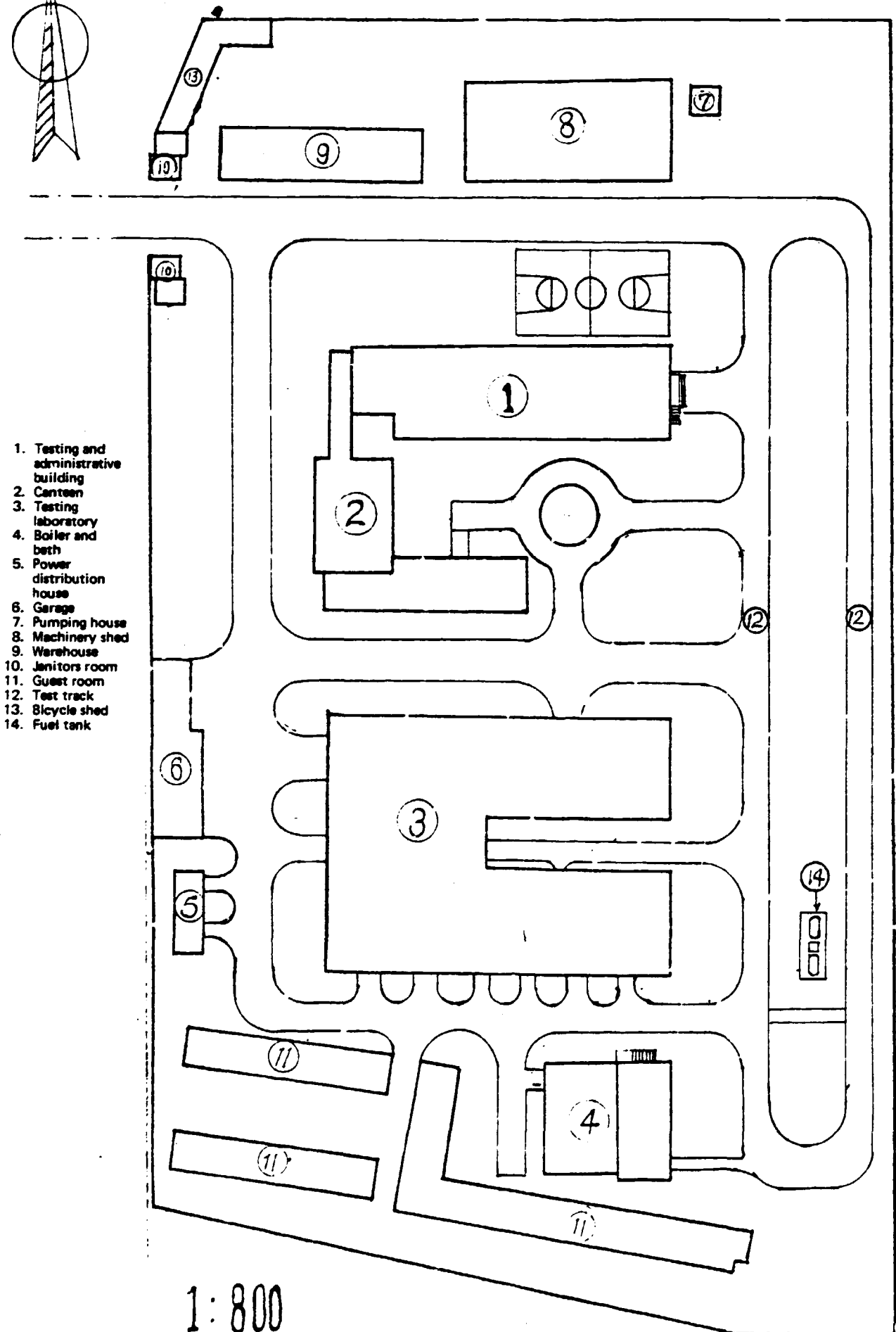
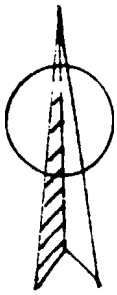
1. Agricultural Machinery Evaluation General Station of Ministry of Agriculture, Animal Husbandry and Fisheries.
2. Agricultural Machinery Evaluation Station of Jiangsu Province.
3. Agricultural Machinery Evaluation Station of Zhejiang Province.
4. Agricultural Machinery Evaluation Station of Hunan Province.
5. Agricultural Machinery Evaluation Station of Hubei Province.
6. Agricultural Machinery Evaluation Station of Jiangxi Province.
7. Agricultural Machinery Evaluation Station of Sichuan Province.
8. Agricultural Machinery Evaluation Station of Guangdong Province.
9. Agricultural Machinery Evaluation Station of Guangxi Zhuang Autonomous Region.
10. Agricultural Machinery Evaluation Station of Yunnan Province.
11. Agricultural Machinery Evaluation Station of Huizhou Province.
12. Agricultural Machinery Evaluation Station of Fujian Province.
13. Agricultural Machinery Evaluation Station of Shandong Province.
14. Agricultural Machinery Evaluation Station of Shanxi Province.
15. Agricultural Machinery Evaluation Station of Gansu Province.
16. Agricultural Machinery Evaluation Station of Nei Mongol Autonomous Region.
17. Agricultural Machinery Evaluation Station of Heilongjiang Province.
18. Agricultural Machinery Evaluation Station of Jilin Province.
19. Agricultural Machinery Evaluation Station of Liaoning Province.
20. Agricultural Machinery Evaluation Station of Xinjiang Autonomous Region.
21. Agricultural Machinery Evaluation Station of Tianjin Municipality.
22. Agricultural Machinery Evaluation Station of Beijing Municipality.
23. Agricultural Machinery Evaluation Station of Anhui Province.
24. Agricultural Machinery Evaluation Station of Schanxi Province.
25. Agricultural Machinery Evaluation Station of Ningxia Autonomous Region.
26. Agricultural Machinery Evaluation Station of Henan Province.
27. Agricultural Machinery Evaluation Station of Hebei Province.
28. State Farm. General Bureau of Heilongjiang.

APPENDIX VI : (Copy of a document received from the Centre in october 1983)

THE ORGANIZATION OF  
THE AGRICULTURAL MACHINERY TESTING CENTRE



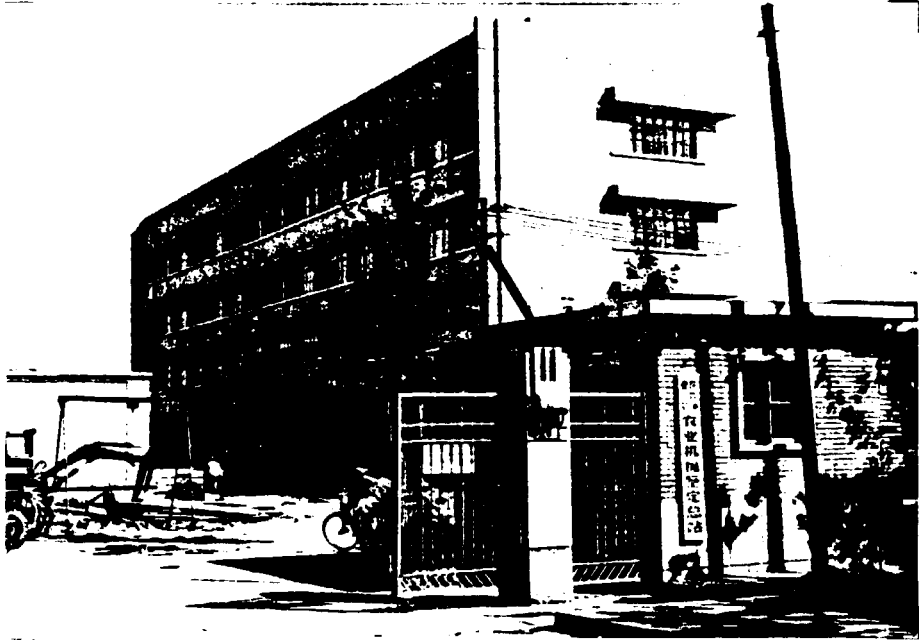
APPENDIX VII : PLAN OF THE CENTRE



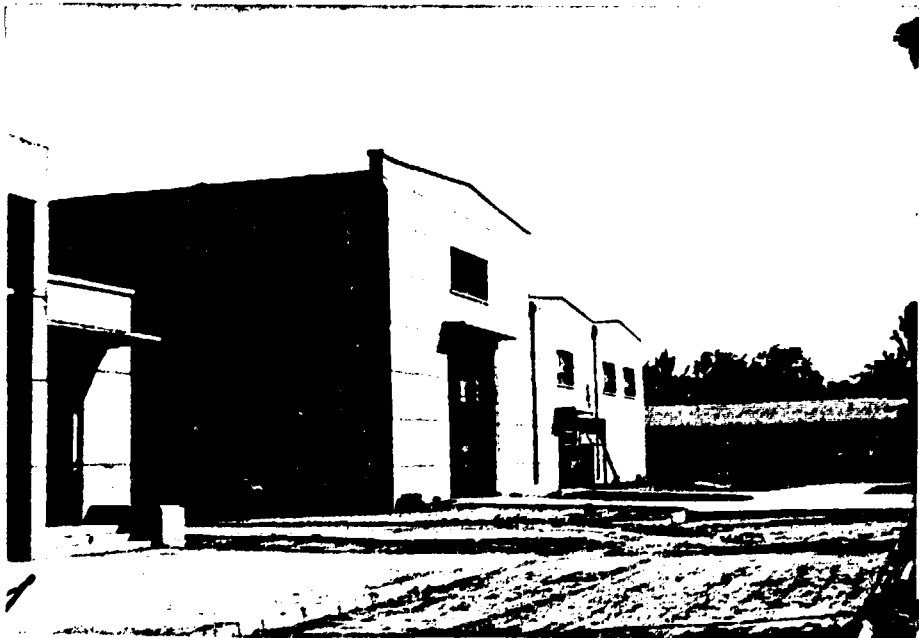
- 1. Testing and administrative building
- 2. Canteen
- 3. Testing laboratory
- 4. Boiler and bath
- 5. Power distribution house
- 6. Garage
- 7. Pumping house
- 8. Machinery shed
- 9. Warehouse
- 10. Janitors room
- 11. Guest room
- 12. Test track
- 13. Bicycle shed
- 14. Fuel tank

1 : 800

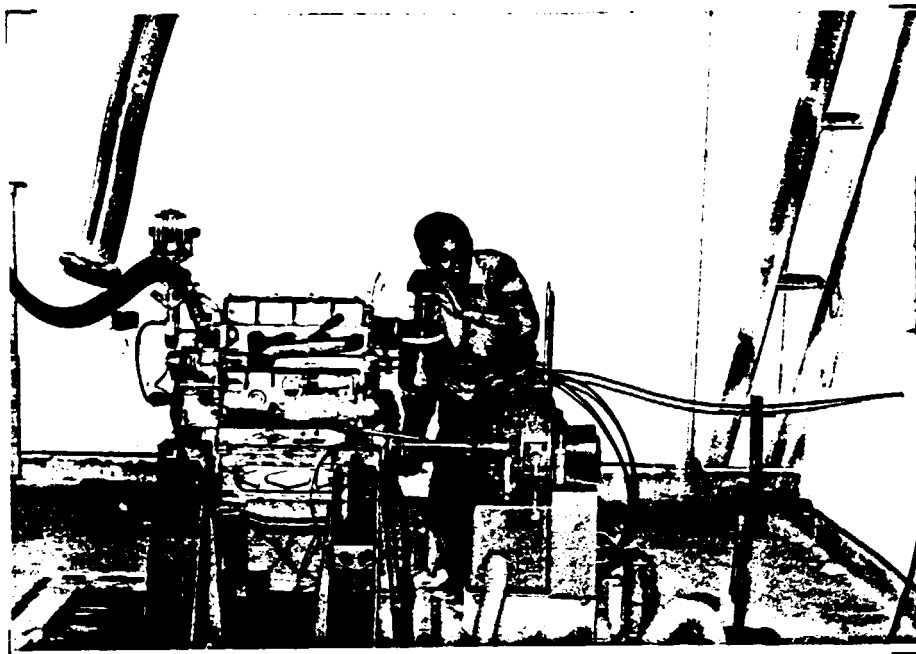
APPENDIX VIII : PHOTOS



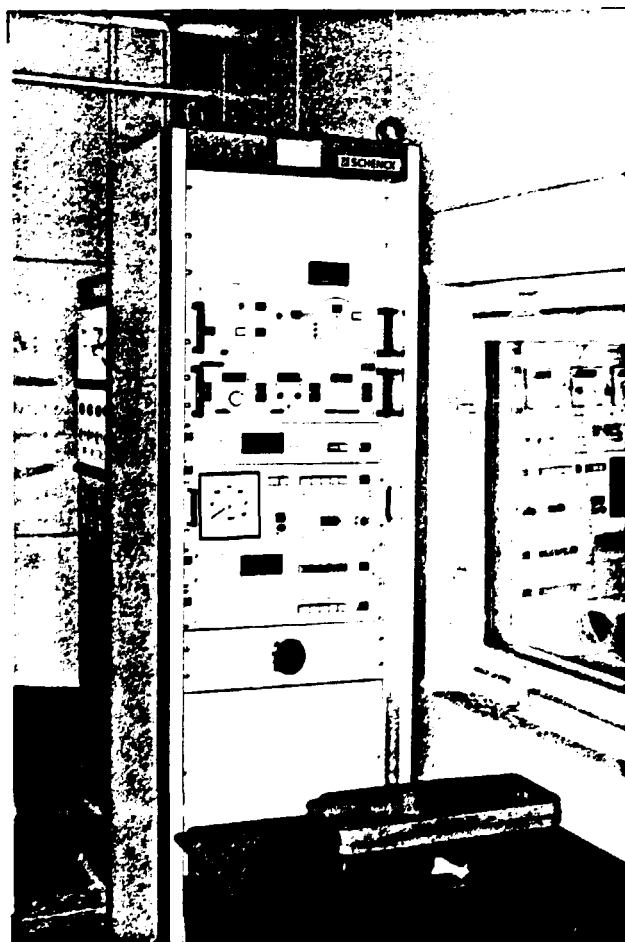
Entrance of Beijing Centre. Technical and administrative building



Test rooms and workshops



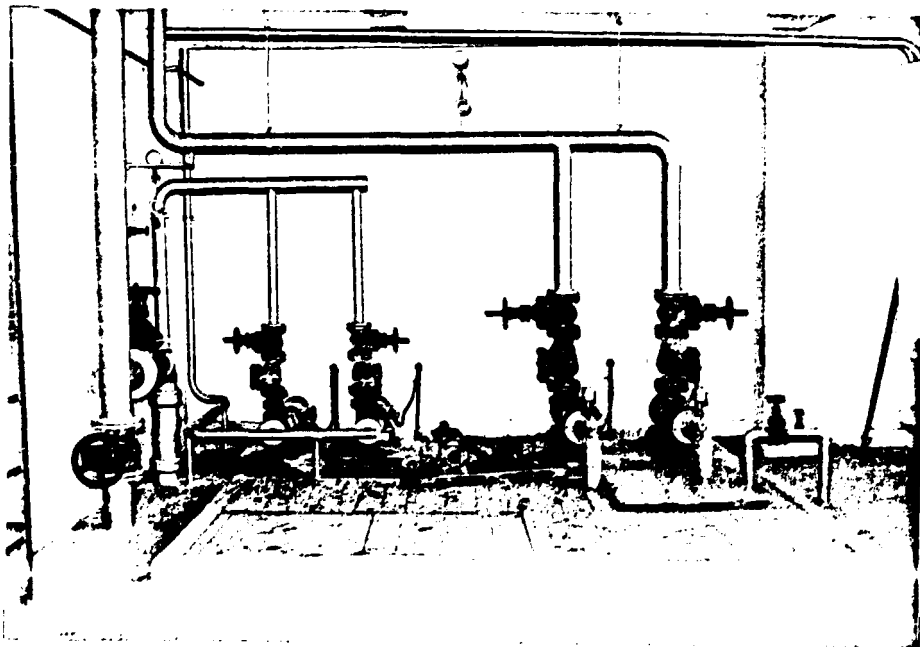
Positioning of a motor on the brake W 50



Control racks of the brake W 700



Positioning of a tractor on the  
power take-off test bench

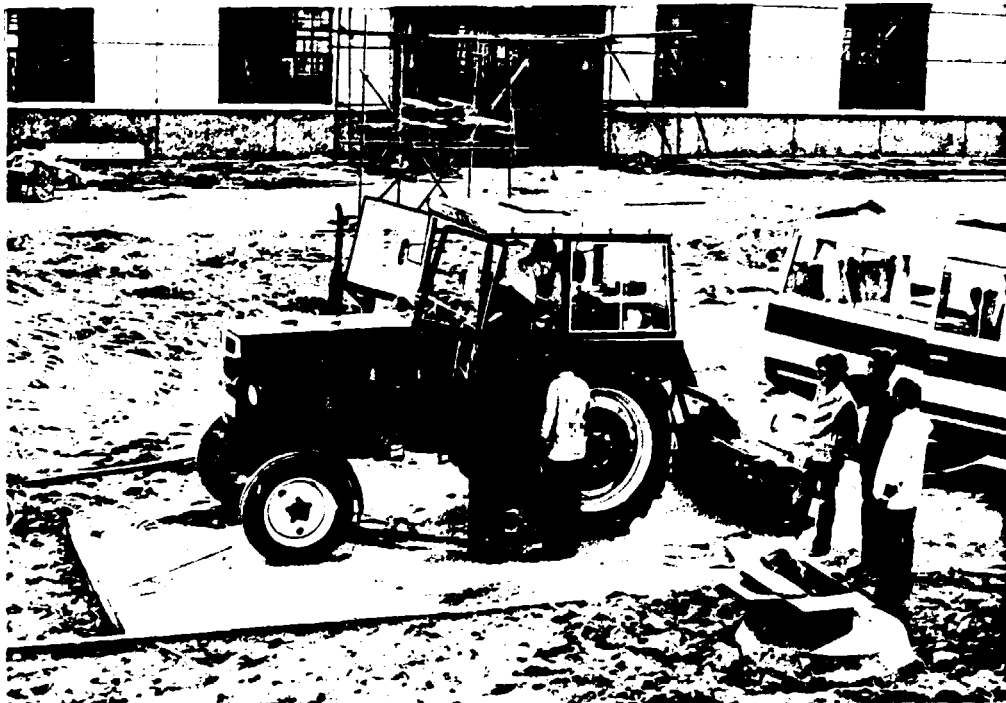


Brake cooling system





**CEMAGREF dynamometric hitch bars (in red)**



**Preparation of the Tie Niu tractor and of the IGN rotary cultivator in the Centre's courtyard before the field test**



General view of the field test



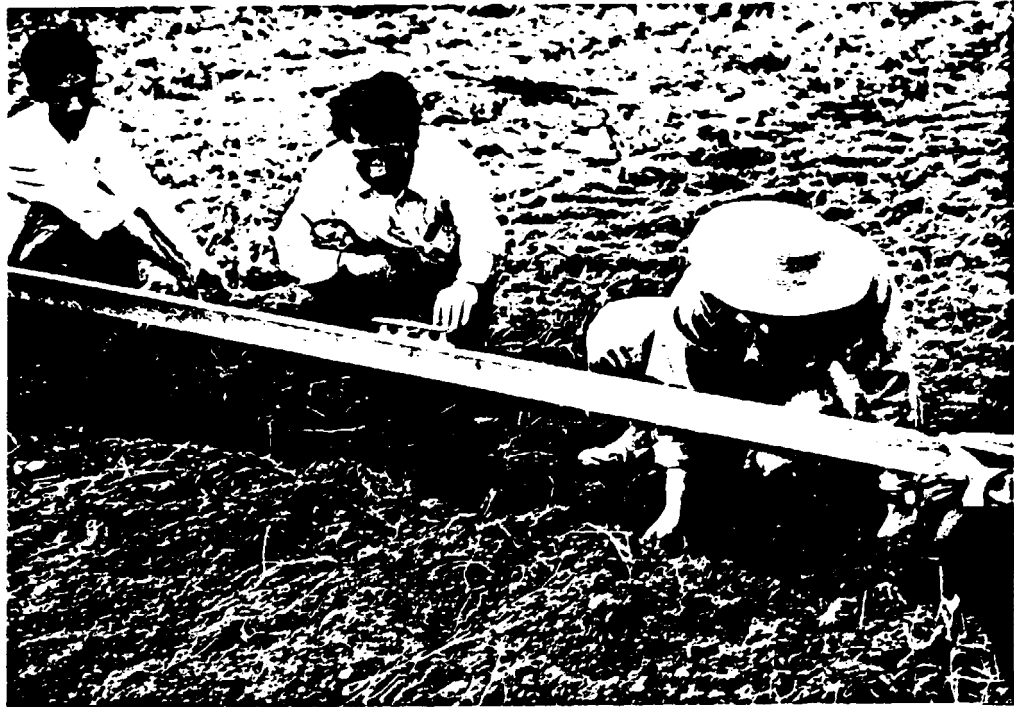
Positioning of the telemetry vehicle



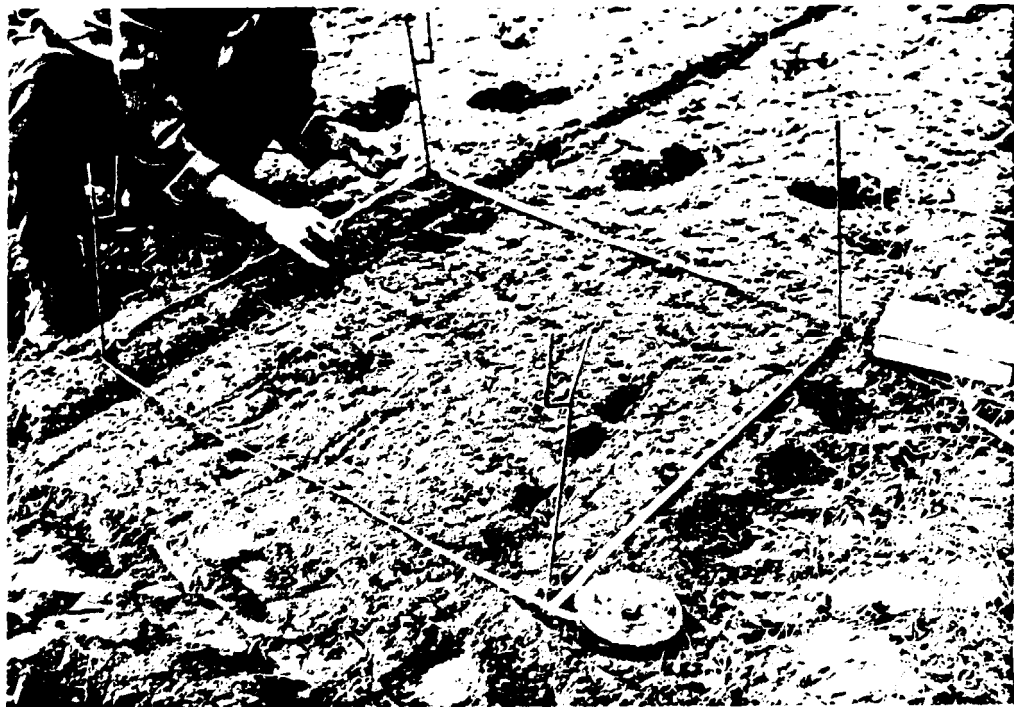
Tractor and rotary cultivator at work  
during the field test



Equipment at work on the  
soil loosening measurement site



Positioning the horizontal bar before  
measuring the soil loosening and the tillage depth



Measuring the percentage of incorporation

14162  
(2 of 4)

PROJECT FOR THE CHINA AGRICULTURAL  
MACHINERY TESTING CENTRE

United Nations Development  
Program : Project DP/CPR/80/017

Contract concluded with CEMAGREF  
for the project implementation  
(United Nations Organization for Industrial  
Development : contract T 81/23)

Mr. MECHINEAU Didier's mission to China  
September 8th to October 8th, 1983

REPORT BY THE CONSULTANT SPECIALIZED IN ELECTRONIC  
AND COMPUTERIZED SYSTEMS

PROJECT FOR THE CHINA AGRICULTURAL  
MACHINERY TESTING CENTRE

United Nations Development  
Program : Project DP/CPR/80/017

Contract concluded with CEMAGREF  
for the project implementation  
(United Nations Organization for Industrial  
Development : contract T 81/23)

Mr. MECHINEAU Didier's mission to China  
September 8th to October 8th, 1983

REPORT BY THE CONSULTANT SPECIALIZED IN ELECTRONIC  
AND COMPUTERIZED SYSTEMS

C O N T E N T S

- SUMMARY

- INTRODUCTION

I - Operation of the computerized system, the telemetry system with its interface and the field measurement devices.

II - Seminars.

III - General remarks concerning the visits that were made as well as the organization of the Testing Centre and the equipment taken from the electronic and computerized system point of view.

Appendix 1 - Daily report handed over to the Director of the Beijing Evaluation Centre.

Appendix 2 - Curves of SHANGHAI 50 tractor p.t.o. bench testing  
Curves of TIENU 80 tractor testing  
Curves of 495 A engine testing.

Appendix 3 - List of people attending the seminars.

Appendix 4 - List of the staff directly in contact with the consultant.

Appendix 5 - Example of curve output obtained with CEMAGREF software.

Appendix 6 - Diagrams of the various telemetry connections.

S U M M A R Y

The aim of the contract concluded between UNIDO and CEMAGREF was to plan and provide the equipment required for the China Agricultural Machinery Testing Centre and to set up this equipment for carrying out official tests.

The mission included four phases :

1) Operating the supplied equipment.

The main equipment consisted of :

- A scientific computer with its peripheral units (plotter, floppy disk drive, printer, voltmeter).
- A telemetry-computer interface designed and built by CEMAGREF.
- Data analysis software.

2) Theoretical and practical training of the staff.

The equipment was described item by item and its operation was explained using examples which enabled also to revise some theoretical aspects. The training task was an important part of the consultant mission.

3) Carrying out of a field test using the whole equipment : from the sensors mounted on tractors to the computerized analysis.

4) Presentation of four seminars which allowed the summing up of the modern techniques of electronics, measuring and computerized systems.

Subjects of the seminars :

- Digital techniques  
(scientific computer)
- Digital telemetry
- Sensors
- Applications of electronics to the agricultural machines.



## INTRODUCTION

The mission which took place within the framework of the contract concluded between UNIDO and CEMAGREF was aiming at equipping the China Agricultural Machinery Testing Centre of Beijing with the equipment required for carrying out official tests and performance evaluation of machines.

### Training phase in France

The first training phase of this contract was concerned with the reception of three Chinese engineers into the CEMAGREF for a technical course from August 1982 to January 1983. Each of the three consultants was in charge of the training of one trainee in his application field ; for the author of this report, it was concerned with the applications of electronic measuring techniques (including telemetry) and computerized systems to agricultural machine tests. During his training course in France, Mr. LI Xi-Jiang worked mainly on measuring techniques and computerized systems, took part in the installation of the sensors on the tractor which was used for the field test and learnt to program the HEWLETT PACKARD scientific computer and its peripheral devices :

- plotter (HP 7225)
- floppy disk reading and recording unit (HP 9895)
- printer (HP 82905)
- voltmeter (HP 6940)

Programs were designed by the trainee and used within the general framework of the training course, consisting for example in plotting the power curves of a tractor tested on the power-take-off test rig.

The field test carried out in January 1983 had enabled the trainee to handle the telemetry during an actual test. Unfortunately the data recorded could not be processed on computer before the trainees' departure (February 1983).

The second training phase occurred in Beijing with a larger attendance of people interested in these new techniques and in their possibilities. The seminars provided the opportunity to draw up a synthesis both for the Centre staff and the numerous representatives of other Chinese regions (see appendix).

### Equipment supplied

The major part of equipment was supplied within the scope of the contract as far as telemetry and computerized systems are concerned :

- a scientific computer (HP 9845) fitted with various peripheral devices
- a 16 channel telemetry with digital data magnetic recording
- an interface developed by CEMAGREF to transfer telemetry data to the computer.

Software designed by CEMAGREF allowed the processing of data recorded during the field test carried out in FRANCE. They also made possible a first analysis of the field test carried out in Beijing before the consultant departure.

## I - OPERATION OF THE COMPUTERIZED SYSTEM, THE TELEMETRY SYSTEM WITH ITS INTERFACE AND THE FIELD MEASUREMENT DEVICES

### I.1. Starting-up of the equipment and training of the staff in the use of computerized systems.

The equipment inventory was made during the meeting called by the head of the consultant team in July 1983. The equipment tested in FRANCE before its dispatching to China had to be checked after the transport.

We had asked not to start the equipment apart from the computer for which precise instructions had been given. The starting-up of the scientific computer took place with a comprehensive and detailed description of the equipment. Each part of the computer and peripheral units was tested as far as possible through programs supplied by the manufacturer. Only one operating fault was pointed out on the floppy disk reading and recording dual unit. The unit was scrupulously taken apart by the consultant who found out the failure : the displacement of a driving belt, which seems to result from vibrations during transport, mechanical parts being in this respect more fragile than electronic ones. It turned out to be necessary to supplement the training of the staff in the use of computerized systems, within the limits of time allowed as the Basic language was unknown. It is worth noting that the Centre did not own any computer except a micro-computer (with a Z 80 microprocessor) which had been just supplied but not put into use. It has been difficult to evaluate the potential of this

equipment without documentation available at the Centre. Nevertheless it appeared through the provided information that its performances are limited particularly as far as the data storage on magnetic medium is concerned (5" 1/4 floppy disk).

The data collected from the field tests carried out in France (January 1983) had been stored on floppy disks. It allowed the use of, for an example, data analysis software as this operation could not be carried out in France before the trainees' departure. This concrete example turned out to be an excellent basis to increment training in programming with the scientific computer.

The starting-up of the telemetry system together with its interface and the computerized system was achieved with the same method. The system consists of a magnetic recorder which enables one to read data recorded on removable tapes. Recordings made in France were read over at the Centre and used as a basis for equipment description. The different configurations of the telemetry equipment were tested in the laboratory :

- when directly connected, without teletransmission
- when reading over the data stored on the magnetic recorder
- when the teletransmission was on.

The above-mentioned equipment can be easily manipulated but it is necessary to know thoroughly digital techniques as well as basic principles of data processing. The consultant mission was not only concerned with starting-up the equipment but also with training the staff in techniques which were not familiar.

The interface supplied by CEMAGREF enables the transfer of data recorded by the telemetry system to the scientific computer in order to process them. The interface was described both from the technological (integrated circuits) and operational (timing diagram) points of view. The data recorded in France could be read again through software also supplied by CEMAGREF.

The telemetry and scientific computer system was operated at the laboratory of the Beijing Evaluation Centre.

A digital voltmeter (HP 6940) was supplied together with the equipment ; it can be connected to the scientific computer through the 16 bit parallel interface previously used for the connection with the telemetry.

It includes mainly an analog-to-digital converter and a multiplexer allowing 16 analog channels to be available as an input.

The converter was operated and data could be introduced into the scientific computer. The multiplexer could not be tested before the consultant's departure but precise instructions were given.

## II - SEMINARS

The program of the four seminars held during the mission was arranged in collaboration with the Direction of the Centre.

The following topics were tackled by the consultant :

### 1) Digital techniques and use of the HP 9845 scientific computer.

- How electronics and techniques evolved from the electron tube to the microprocessor.

- Transistor operation.

- Integrated circuits.

- Boolean algebra.

- Wired logic.

- Description of the internal structure of a microprocessor.

- Analysis of the internal operation of a microprocessor for a few instructions.

- Description of the scientific computer and performance analysis.

### 2) The JOHNE + REILHOFER telemetry system.

- Review of the digital techniques.

- Digital operation of the system (Pulse coded modulation).

- Determination of the rate (in Kilobits/s) according to the spectrum of input analog signals.

- Description of the digital output of the system.

- Limits of data transfer to the scientific computer ; hence the necessity to use an interface.

- Timing diagram of the CEMAGREF interface.

- How to use the software supplied by CEMAGREF.

### 3) Sensors used on agricultural machines.

- Classification of various types of sensors.

- Description of all the sensors that can be used and review of the physical effects referred to.

- Selection of well-known applications to illustrate the subject.

./.

#### 4) Applications of electronics to agriculture

- A comprehensive survey of agricultural machines fitted with electronic devices was presented with slides.

The lecturer spoke to a large audience including :

- The staff of the Centre.
- Representatives from other Chinese regional testing stations (see the list enclosed in appendix).

The remarks concerning technical developments were listened with great interest by the staff of the Centre and specially by the staff of the laboratory involved in measurement and computerized systems ; but representatives from the Chinese regional testing stations were more interested in applying these new technologies to farm machinery tests.

### III - GENERAL REMARKS CONCERNING THE VISITS THAT WERE MADE AS WELL AS THE ORGANIZATION OF THE TESTING CENTRE AND THE EQUIPMENT FROM THE ELECTRONIC AND COMPUTERIZED SYSTEM POINT OF VIEW.

#### 1) Structure and training

The Beijing Testing Centre is made up of several divisions. Mr. LI, who has been to France as a trainee and learned the basics of telemetry and scientific computer use, does not belong to the "Measurement and Computerized Systems" Division. Nevertheless, he played an important part as a coordinator throughout the three consultants' mission.

Consequently, the training-session initiated in France had to carry on with the staff of the Division, since they will be the main users of the equipment of which the consultant was in charge. It should be pointed out that their basic training was suited to the technologies implemented. During the month's work, two teams were formed :

- for computerized systems : Mrs. GAO Hei-Jiuen  
Miss CHENG Pei-Howa
- for Electrical Measurement and Telemetry : Miss CHEN Shan  
Mr. LI Bi-Chi  
Miss CHEN Hai-Yien

It should be noted that if basic university training is sufficient on theoretical aspects, it is rather inadequate when it comes to practical applications because of a lack of familiarity with present-day technologies.

It was often necessary to refer to known concepts and to apply them to concrete cases in order to explain clearly how the various components worked and how to use them. Due to the trainees' inexperience, the consultant's mission, when it came to initiating the use of the equipment often turned into private tutorials to explain procedures clearly.

## 2) Laboratory equipment

The Testing Centre installation in its new buildings was too recent and therefore it cannot be expected to have all the basic equipment to be found in a measurement and computerized systems laboratory. Such equipment is available in China, as was confirmed by the Beijing Electronics Exhibition which the consultant visited.

## 3) Electrical wiring

The electrical wiring of the new premises was not entirely completed. The measurement and computerized systems laboratory, in particular, were not earthed. This represents a potential danger for operators in the event of an electrical failure in the electronic equipment. Mr. TU Bingheng, deputy head of the Testing Centre, was told about this elementary protection before the consultant departure.

The electrical network is submitted to voltage drops which are much too great to ensure good functioning of the electronic equipment. Therefore, a voltage regulator should be added. It is available in China where it is manufactured. A few hotels equipped with microcomputers use them.

These two last problems should be solved by the Beijing Evaluation Centre so that the equipment can work properly and the operators can be effectively protected against electrical hazard.

## 4) Visit to the Beijing Academy of Agricultural Mechanization Sciences

A quick visit allowed to get an overall picture of the Academy activities :

- A photoelasticity laboratory (mainly optics).
- A hydraulics laboratory (with some measuring instruments).
- A soil tillage laboratory, particularly with a computerized system of data logging (a Japanese equipment).
- Test rigs for power testing of engines, tractors and farm machines.

We did not visit the computer centre, nor the measurement laboratory.

## 5) Beijing electronics fair

This fair had an important popular success but apparently many visitors were not specialists. Chinese-made micro-computers (which a microprocessor Z 80) were worth seeing as they are able to converse and print in Chinese. The measuring instruments are still rough and quite unsophisticated, a lot of improvements are still to be done in this field. It should be noted that one important concern of the Chinese Authorities seems to be electronic training as illustrated by the basic courses on television.

### I.2. Operation of field measurement devices :

Another important part of the consultant mission consisted of the carrying out of field tests with available equipment. A tractor fitted with a rotary cultivator was selected. Several meetings held previously and at the beginning of the mission had decided which sensors were required for the test and how to plan their mechanical assembly.

The following physical data were measured :

- The torque at the power-take-off (torque meter)
- The p.t.o. rotation speed (torque meter)
- The actual speed of the tractor (Doppler radar)
- The rotation speed of the two drive wheels (proximity sensor).

The sensors were quickly set up and wired with the help of many people so that field tests could be carried out before the consultant's departure.

An air-conditioned laboratory vehicle had been designed and fitted by the Beijing Testing Centre itself. It is unfortunate that such a laboratory vehicle cannot be easily moved, because one often needs to go to the very edge of the field where the test is being carried out, which entails some difficulties.

The field measurements were made on a plot close to the Centre after a first quick test carried out in the Centre courtyard. The telemetry vehicle with the receiving unit was placed on the side of the field, under an electric wire, which allowed the testing of telemetry under real conditions.

The tractor was fitted with a dynamo, in bad working order, which caused interferences on the 12 V supply of the emitting unit of the telemetry system. After the tractor dynamo was disconnected, the telemetry ran perfectly and the test defined by another consultant could be carried out in good conditions.

In the laboratory, the data recorded were transmitted through the interface to the scientific computer. A first analysis of the raw data was made with the processing software supplied by CEMAGREF. The software modifications resulting from the use of different sensors (p.t.o. and 2 wheel drive rotation speed) were examined with the Chinese partners and will have to be carried out by the Centre staff for further analysis of the data.

### I.3. Operation of the automatic data processing of the laboratory tests on tractors and engines :

The software supplied by CEMAGREF enables the plotting of curves of the tractor or engine tests performed on the Schenck brakes supplied within the scope of the contract. As soon as the test was completed, Mr WANG Yuan-Xiang (one of the three trainees who attended the course in France, and who is specialized in farm tractor tests) could use by himself the scientific computer and the software to plot the curves (see in appendix a few examples of such plotting).

#### IV - CONCLUSION

All the telemetry and computerized systems equipment were in good order when the consultant left the Testing Centre. Instructions were given, particularly for the telemetry ; it has been requested that only two or three persons should be allowed to use this equipment which is not likely to be damaged but there is still a risk of recording incorrect data if the adjustments are made erroneously.

The software supplied as examples by CEMAGREF should be adapted by the staff of the Centre to meet their needs.

The university training of the staff met by the consultant when he was in China did not seem to have been put into practice ; many concepts, were known, but not transposed concretely ; the need to understand and thoroughly study the new technologies available resulted in the consultant's task being predominantly training.

We have to thank Mr. GUO Ren, the Centre Director, for his welcome to the consultants as well as Mr. TU Bingen, Deputy-head, who very efficiently organized our stay. Our interpreter was also of great help.

The coordination insured by Mr. LI Xi-Jiang allowed the sorting out of some of the problems raised by recent installation in new buildings.

All the staff with whom the consultant worked during the whole of the month should be thanked also for the interest shown in the new technologies presented and the high professional quality of the work carried out.



ANNEXE N° 1  
 000000000000000000

RAPPORT CHRONOLOGIQUE REMIS AU DIRECTEUR DE LA STATION D'ESSAI  
 =====

SEMAINE DU 12 AU 16 SEPTEMBRE 1983  
 -----

LUNDI 12 SEPTEMBRE 1983  
 -----

- Visite de la station d'essai.
- Réunion avec M. TU (Directeur Adjoint) entouré de ses collaborateurs afin de définir le programme de travail de la mission.
- Installation et mise en route du calculateur HEWLETT PACKARD HP 9845.
  - Test de la mémoire.
  - Programme de test de l'écran graphique.
  - Test des lecteurs-enregistreurs de cassettes.
  - Test de l'imprimante thermique interne au calculateur.
- Installation et mise en route du lecteur-enregistreur de disques souples . (HP 9895)
  - Le premier test est interrompu par des erreurs.
  - Démontage de l'unité de disques souples.
  - Déblocage des ressorts de rappel de l'éjecteur de disques.
  - Repositionnement d'une des courroies d'entraînement.
  - Le deuxième test est satisfaisant; ces deux problèmes sont certainement dus aux chocs et vibrations du transport.
- Installation et mise en route du traceur de courbes (HP 7225)
  - Test du traceur.
- Installation et mise en route de l'imprimante (HP 82905)
  - Test de l'imprimante.

Le calculateur et l'ensemble des périphériques sont opérationnels.

MARDI 13 SEPTEMBRE 1983

- Description du calculateur HP 9845.
- Description des supports magnétiques et utilisation des divers fichiers.
- Description du BASIC HEWLETT PACKARD.

MERCREDI 14 SEPTEMBRE 1983

- Mise en place du programme de dépouillement des essais de tracteurs à la prise de force.
- Sortie de courbes du premier essai de tracteur réalisé à la station d'essais.
- Réunion de préparation de l'essai de terrain avec la télémesure.

Jeudi 15 SEPTEMBRE 1983

- Relecture par la télémesure des données de l'essai de terrain réalié au cours du stage en FRANCE de trois ingénieurs de la station d'essai (en Janvier 1983).
- Description détaillée de chaque module de la télémesure.

VENDREDI 16 SEPTEMBRE 1983

- Installation et description de l'interface CEMAGREF permettant le transfert des données télémesure vers le calculateur.
- Installation et mise en route des programmes de relecture des données enregistrées en JANVIER 1983.
- Câblage et installation sur un tracteur de l'indicateur de consommation (préparation à l'essai de terrain).

SEMAINE DU 19 AU 24 SEPTEMBRE 1983LUNDI 19 SEPTEMBRE 1983

- Essai sur tracteur de l'indicateur de consommation.
- Description des programmes de dépouillement des données télémessure.

MARDI 20 SEPTEMBRE 1983

- Utilisation des programmes de dépouillement télémessure.
- Sortie d'un essai de tracteur à la prise de force (TIENU-80).

MERCREDI 21 SEPTEMBRE 1983

- Mise en route du coffret de comptage.
- Test des divers capteurs.

JEUDI 22 SEPTEMBRE 1983

- Essai de consommation sur tracteur avec le coffret de comptage.
- Comparaison avec l'indicateur de consommation SCHENK du banc d'essai.

VENDREDI 23 SEPTEMBRE 1983

- Conférence : "Les Techniques Numériques".

.../...

SEMAINE DU 26 AU 30 SEPTEMBRE 1983LUNDI 26 SEPTEMBRE 1983

- Réunion préparation essai de terrain avec télémessure.
- Mise en route de la partie émission-réception de la télémessure.

MARDI 27 SEPTEMBRE 1983

- Conférence: "La Télémessure en Technique PCM".
- Démonstration de la télémessure en laboratoire.
- Démonstration du calculateur HP 9845.
  - Utilisation du programme de sortie des courbes d'essai à la prise de force de tracteurs.
  - Utilisation des programmes de dépouillement de la télémessure.

MERCREDI 28 SEPTEMBRE 1983

- Installation des capteurs sur le tracteur servant à l'essai de terrain.
- Liaison télémessure entre le tracteur et le laboratoire.

JEUDI 29 SEPTEMBRE 1983

- Installation des derniers capteurs sur le tracteur.
- Essai au champ (à quelques kilomètres de la station d'essai) avec le véhicule de télémessure.
- Il y a au départ des problèmes d'alimentation électrique sur le terrain, le tracteur doit être équipé d'une dynamo en mauvais état. La télémessure est alors alimentée par une batterie indépendante. La télémessure fonctionne parfaitement, alors que le camion est installé juste en dessous d'une ligne électrique basse tension.

.../...

(semaine du 26 au 30 Septembre 1983 suite)

VENDREDI 30 SEPTEMBRE 1983

- Relecture des enregistrements de terrain avec la télémessure au laboratoire.

SEMAINE DU 4 AU 7 OCTOBRE 1983

MARDI 4 OCTOBRE 1983

- Conférence : "Les Capteurs".
- Conférence : "L'utilisation de l'électronique dans l'Agriculture".

MERCREDI 5 OCTOBRE 1983

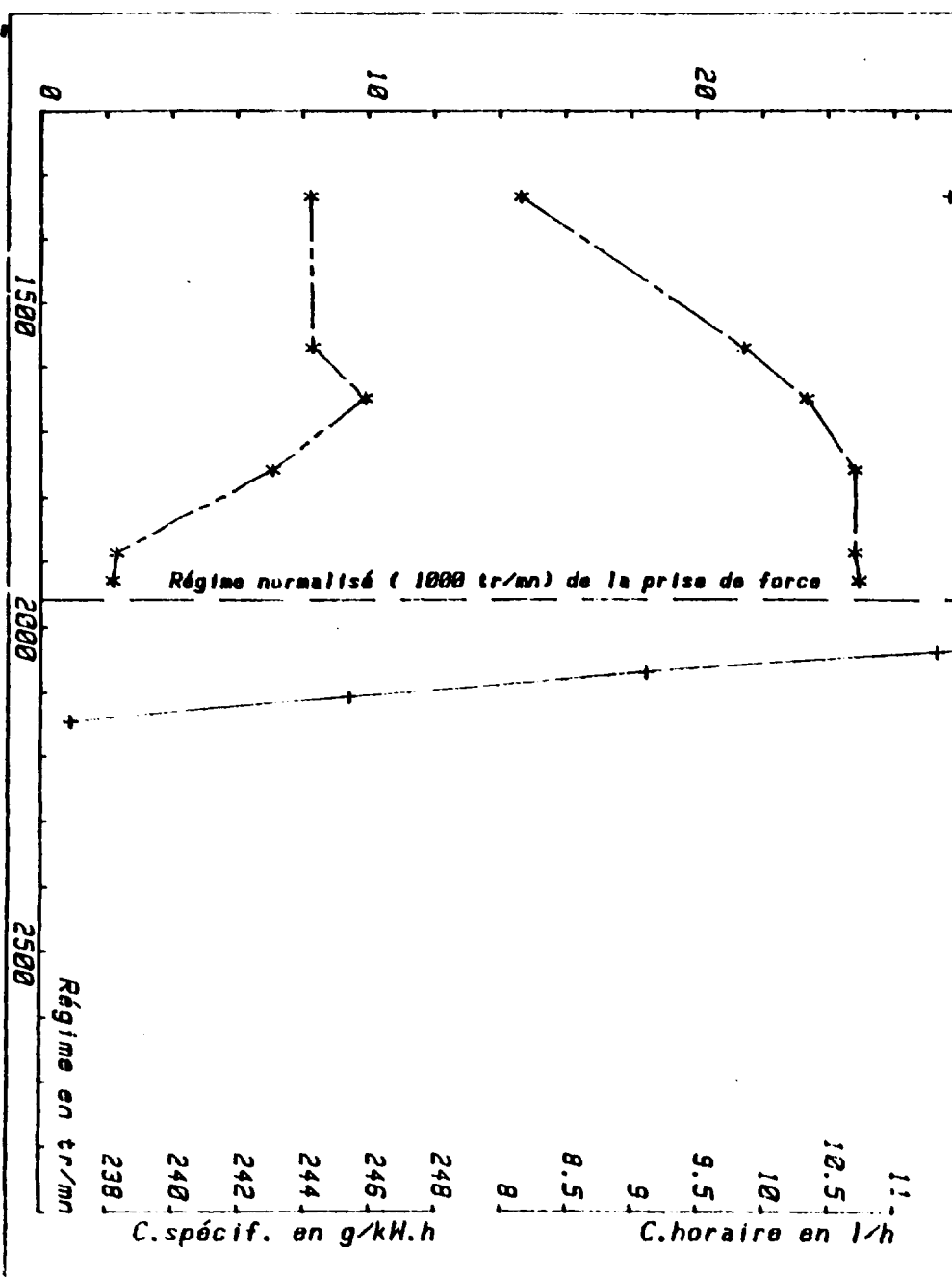
- Transfert des données télémessure vers le calculateur HP 9845.
- Exploitation par le calculateur des données de terrain.

JEUDI 6 OCTOBRE 1983

- Exploitation des données de terrain.

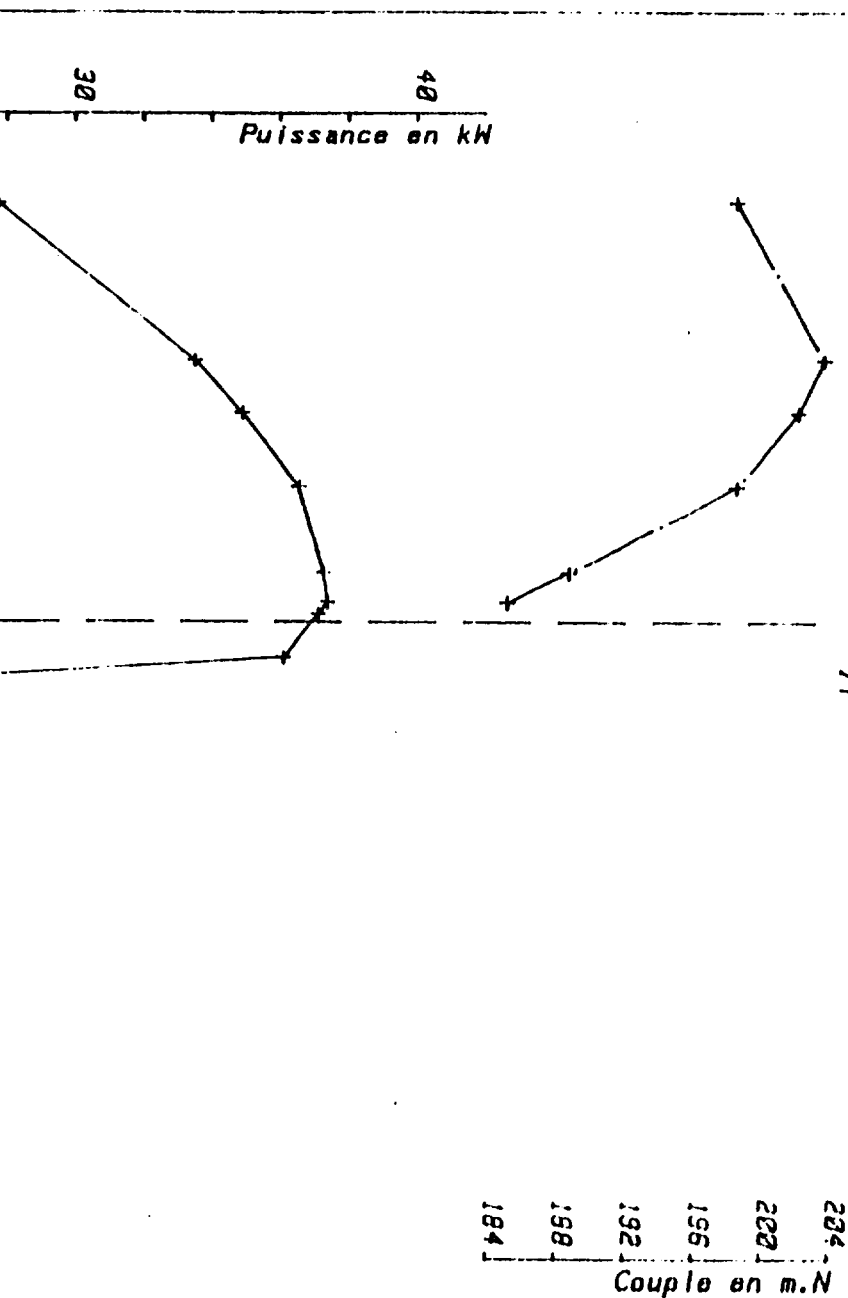
VENDREDI 7 OCTOBRE 1983

- Réunion de conclusion de la mission avec le Directeur de la Station d'Essais.



Essai au ban, à la prise de force principale  
 Tracteur SHANGHAI 50 Type SH 50

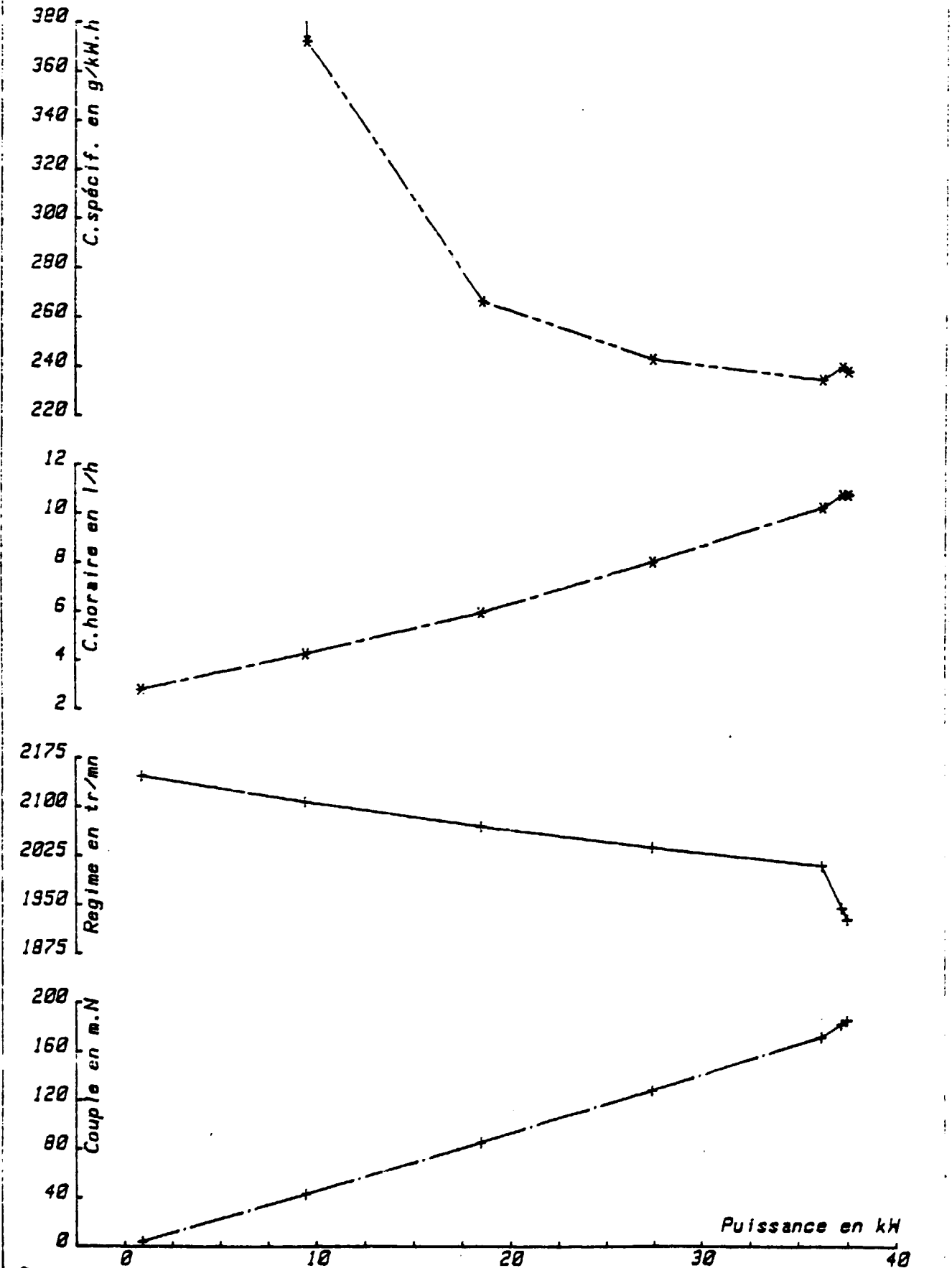
Essai 1  
 Date 14/25/83



Essai au banc à la prise de force principale  
Tracteur SHANGHAI 50 Type SH 50

Essai 1  
Date 14/03/83

Courbes obtenues dans la zone d'action du régulateur





BRANC PRISE DE FORCERESULTATS Essai 1

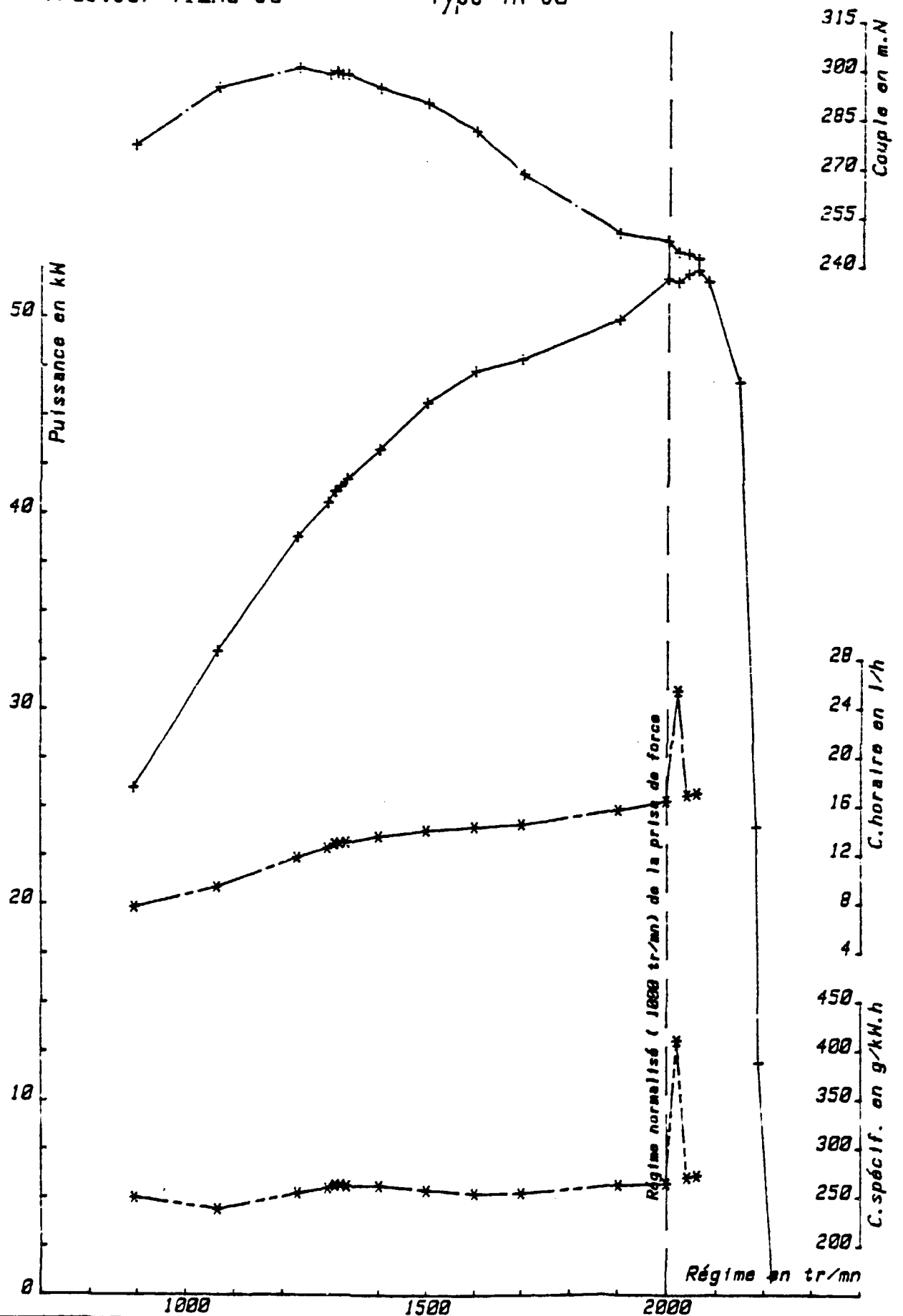
<u>POINT</u>	<u>REGIME</u>	<u>COUPLE</u>	<u>PUISSANCE</u>	<u>C. HORSAIRE</u>	<u>C. SPECIFIQUE</u>
7	1333.4	198.672	27.7412	8.16327	244.24
6	1570.32	203.779	33.5101	9.86301	244.293
5	1649.64	202.247	34.9169	10.3448	245.903
4	1758.28	198.672	36.5309	10.7143	243.101
3	1885.55	188.968	37.3127	10.7143	238.334
2	1928.63	185.393	37.4431	10.7463	238.213
1	1946.25	182.329	37.1606	10.7463	240.024
8	2010.37	171.604	36.1358	10.2273	234.91
12	2038.29	128.192	27.3623	8.01782	243.21
9	2069.61	85.2911	18.485	5.93081	266.301
10	2106.81	42.9009	9.46499	4.24028	371.837
11	2145.97	4.8858	.918182	2.7972	2528.56

<u>MT Essai</u>	<u>Date</u>	<u>Marque</u>	<u>Type</u>	<u>Ban CO</u>	<u>Dens</u>	<u>M/Pdf</u>	<u>NC</u>
T 1	14/09/63	SHANGHAI	50 SH 50	780 1	0.83	1.958	4

<u>POINT</u>	<u>REGIME(PDF)</u>	<u>TEMPS</u>	<u>COUPLE(PDF)</u>	<u>IMPULSIONS OU POIDS</u>
1	994	33.5	357	100
2	985	33.5	363	100
3	963	33.6	370	100
4	898	33.6	389	100
5	842	34.8	396	100
6	802	35.5	399	100
7	681	44.1	389	100
8	1027	35.2	336	100
9	1057	60.7	167	100
10	1076	84.9	84	100
11	1096	126.7	8	100
12	1041	44.9	251	100

Essai au banc à la prise de force principale  
 Tracteur TIENU-80 Type TN-80

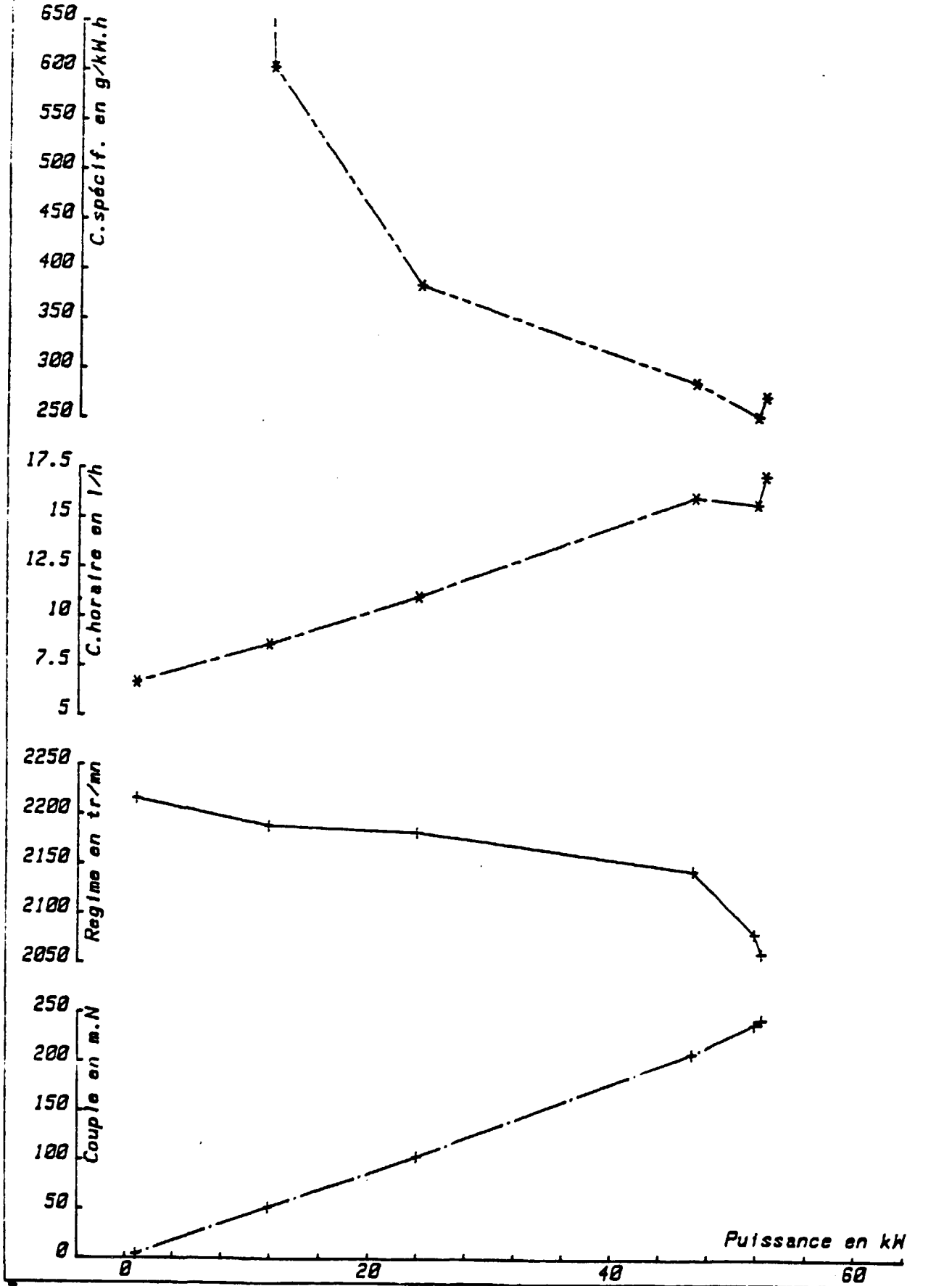
Essai 83-223  
 Date 20/09/83



# Essai au banc à la prise de force principale Tracteur TIENU-80 Type TN-80

Essai 83-003  
Date 20/05/83

Courbes obtenues dans la zone d'action du régulateur

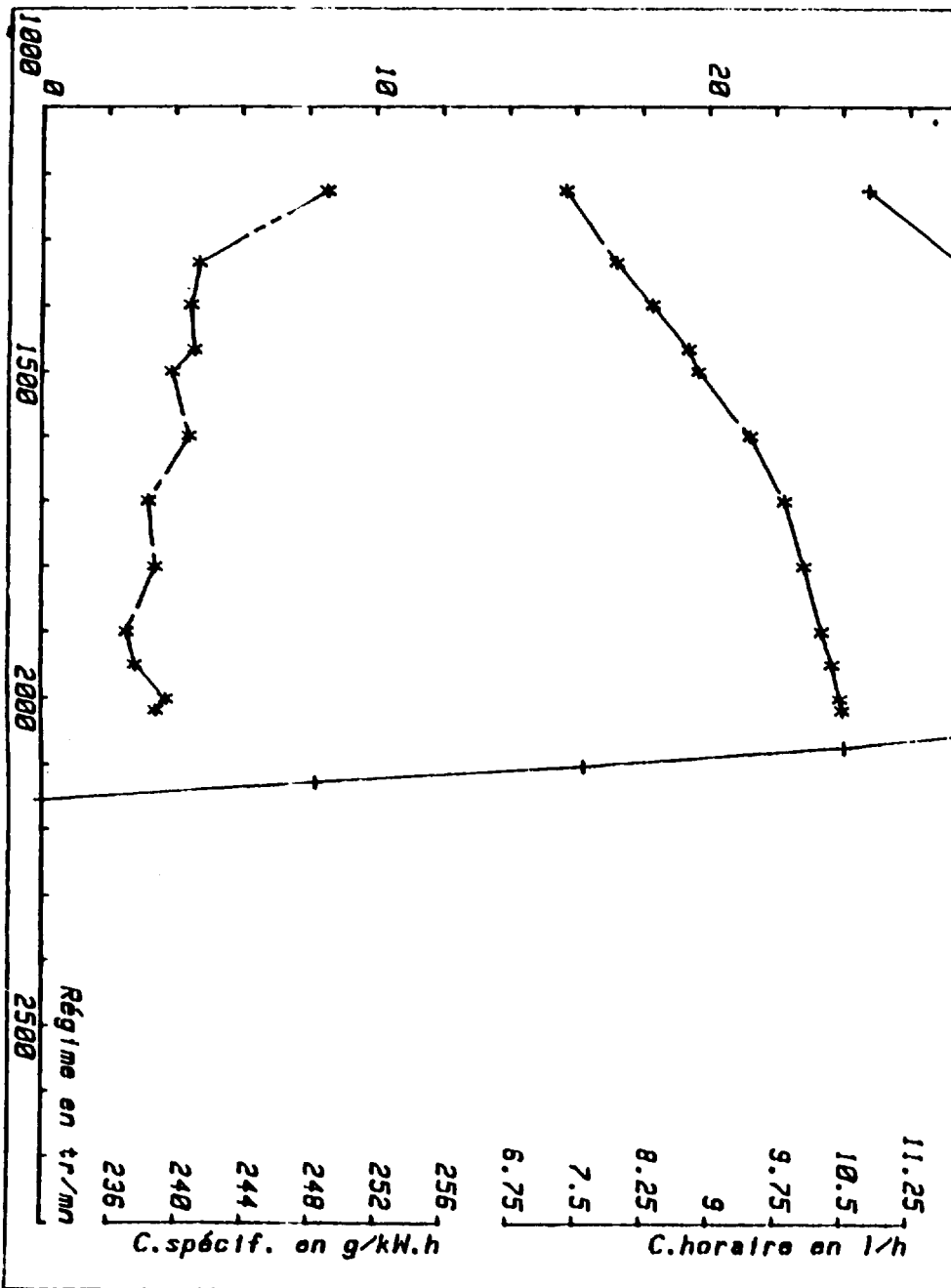


BANC FAISE DE FORCERESULTATS Essai 83-003

<u>POINT</u>	<u>REGIME</u>	<u>COUPLE</u>	<u>PUISSANCE</u>	<u>C. HORRAIRE</u>	<u>C. SPECIFIQUE</u>
17	894	277.5	25.9794	7.79221	250.448
18	1066	295	32.9312	9.39948	338.332
16	1230	301	38.7704	11.8421	255.044
15	1294	299	40.5167	12.6316	260.322
14	1308	300	41.092	12.9496	263.139
13	1310	299.5	41.0863	12.9496	263.176
12	1320	299	41.3308	13.0435	263.516
11	1332	299	41.7065	13.0909	262.091
10	1400	295	43.2492	13.5849	262.28
9	1500	290.5	45.6316	14.0625	257.326
8	1600	282	47.2495	14.3426	253.465
7	1700	269	47.8883	14.5749	254.134
6	1900	251	49.9408	15.7895	263.997
5	1998	248.5	51.9937	16.5138	265.206
1	2020	245	51.8258	25.5319	411.361
2	2040	244.5	52.2321	16.9811	271.466
3	2060	243	52.4206	17.1429	273.067
4	2080	238	51.8404	15.7205	253.212
19	2144	208	46.7	16.0714	287.358
20	2182	105	23.9923	11.0429	384.324
21	2188	52	11.9146	8.59189	602.138
22	2216	4	.928236	6.67904	6008.17

<u>MT Essai</u>	<u>Date</u>	<u>Marque</u>	<u>Type</u>	<u>Ban</u>	<u>CO</u>	<u>Densi</u>	<u>M/PdF</u>	<u>NC</u>
T 83-003	20/09/83	TIENU-30	TN-30	780	1	0.835	2	4

<u>POINT</u>	<u>REGIME&lt;PDF&gt;</u>	<u>TEMPS</u>	<u>COUPLE&lt;PDF&gt;</u>	<u>IMPULSIONS OU POIDS</u>
1	1010	14.1	490	100
2	1020	21.2	489	100
3	1030	21	436	100
4	1040	22.9	476	100
5	999	21.8	497	100
6	950	22.8	502	100
7	850	24.7	538	100
8	800	25.1	564	100
9	750	25.6	531	100
10	700	26.5	590	100
11	666	27.5	598	100
12	660	27.6	598	100
13	655	27.8	599	100
14	654	27.8	600	100
15	647	28.5	598	100
16	615	30.4	602	100
17	447	46.2	555	100
18	533	38.3	590	100
19	1072	22.4	416	100
20	1091	32.6	210	100
21	.094	41.9	104	100
22	1108	53.9	8	100



Essai au banc de moteur

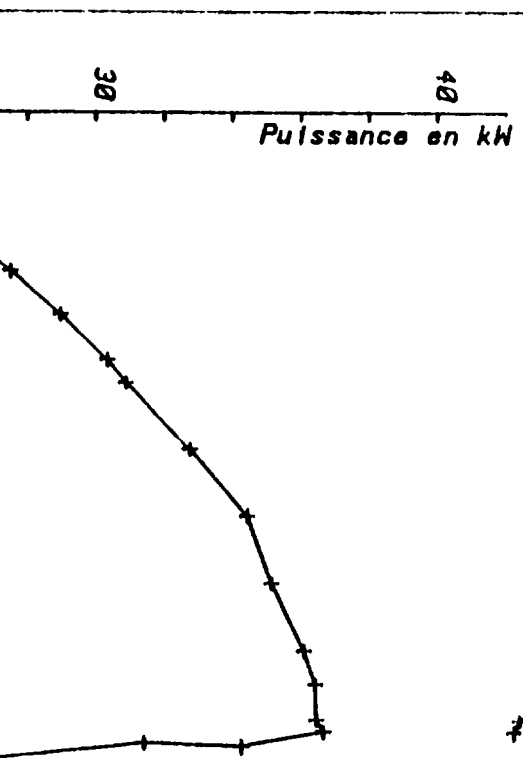
23

Moteur 495A

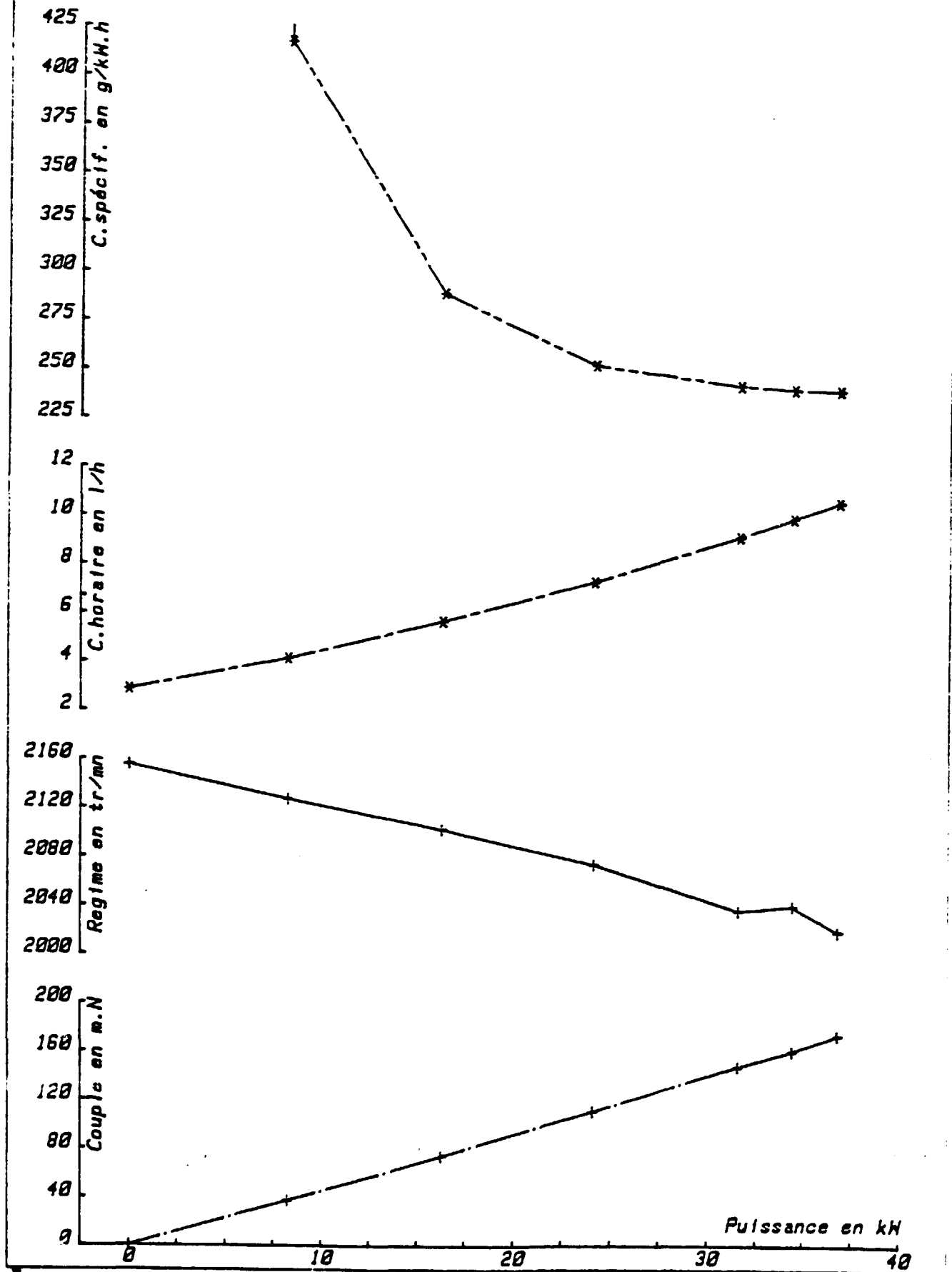
Type 495A

Essai 83-224  
Date 26/9/83

210  
202.5  
195  
187.5  
180  
172.5  
Couple en m.N



Courbes obtenues dans la zone d'action du régulateur



RESULTATS Essai 83-004

<u>POINT</u>	<u>REGIME</u>	<u>COUPLE</u>	<u>PUISSANCE</u>	<u>C. HORAIRE</u>	<u>C. SPECIFIQUE</u>
13	1226	193	24.7786	7.3922	249.106
12	1335	197	27.5408	7.9646	241.476
11	1399	198	29.0076	8.37209	240.995
10	1466	198	30.3968	8.78049	241.2
9	1500	197	30.9447	8.88889	239.854
8	1600	196	32.8401	9.47368	240.88
7	1700	194	34.5366	9.86301	238.46
6	1800	187	35.2487	10.084	238.879
5	1900	182	36.2121	10.2857	237.174
4	1950	179	36.5524	10.4046	237.682
1	2001	174.6	36.5864	10.4956	239.538
2	2019	174	36.7887	10.5263	238.917
3	2040	161	34.3941	9.86301	239.448
14	2036	148	31.555	9.11392	241.17
15	2074	111	24.1079	7.27273	251.898
16	2102	74	16.2889	5.625	288.348
17	2127	37	8.24134	4.10959	416.377
18	2155	.001	.000225671	2.85261	10554900

<u>MT Essai</u>	<u>Date</u>	<u>Marque</u>	<u>Type</u>	<u>Fan</u>	<u>CO</u>	<u>Densi</u>	<u>M/PdF</u>	<u>NC</u>
M 83-004	26/9/83	495A	495A	400	1	0.835	1	4

<u>POINT</u>	<u>REGIME(PdF)</u>	<u>TEMPS</u>	<u>COUPLE(PdF)</u>	<u>IMPULSIONS OU POIDS</u>
1	2001	34.3	174.6	100
2	2019	34.2	174	100
3	2040	36.5	161	100
4	1950	34.6	179	100
5	1900	35	182	100
6	1800	35.7	187	100
7	1700	36.5	194	100
8	1600	38	196	100
9	1500	40.5	197	100
10	1466	41	198	100
11	1399	43	198	100
12	1335	45.2	197	100
13	1226	48.7	193	100
14	2036	39.5	148	100
15	2074	49.5	111	100
16	2102	64	74	100
17	2127	87.6	37	100
18	2155	126.2	.001	100



A N N E X E N° 3  
00000000000000000000

PARTICIPATION DES DIVERS ORGANISMES AUX CONFERENCES  
=====

1°) INSTITUT DE RECHERCHE DE TRACTEURS DE LUOYANG (région du  
LUOYANG)

- XIE Zhi-Qiu.
- ZHOU Guang-Juen.

2°) STATION D'ESSAI DE MACHINES AGRICOLES DE CHENGDU (région  
du SICHUAN).

- LOU Jian-Ke.
- WU Muig.
- NIOU Jie.

3°) STATION D'ESSAI DE MACHINES AGRICOLES DE CHANGCHUN (région  
du JILIN).

- XU Chen-Yuen.

4°) STATION D'ESSAI DE MACHINES AGRICOLES DE KONMING (région  
du YUNNAN).

- FU Quiang.

5°) STATION D'ESSAI DE MACHINES AGRICOLES DE FURZOU (région  
du FUJIAN).

- FANG Tan.

6°) STATION D'ESSAI DE MACHINES AGRICOLES DE TIANJIN (région  
de TIANJIN SHI).

- WANG Juig-Shan.

.../...

7°) STATION D'ESSAI DE MACHINES AGRICOLES DE GUANGZHOU (région  
du GUANGDONG).

- LING Fou-Yao.

8°) STATION D'ESSAI DE MACHINES AGRICOLES DE BEIJING (région  
du BEIJING).

- ZHAO	Jian-Shong
- TANG	Zhen-Qiu
- LIAO	Jiu-Lien
- LI	Zhen-Hong
- LI	Wei
- PIAO	Yu-Xiang
- DENG	Shao-Bou
- LIOU	Dong-Schen
- BEI	Yu-Chun
- TANG	Zhao-Yu
- CHEN	Shan
- LI	Bi-She
- CHEN	Shan
- ZHANG	Zhen-Shen
- FU	Yin
- KAO	Huei-Jiuan
- ZHANG	Mou-Houa
- LI	Xi-Jiang
- WANG	De-Ming
- ZHEN	Pei-Houa.

A N N E X E N° 4  
000000000000000000000000

PRINCIPALES RELATIONS DU CONSULTANT AVEC LE PERSONNEL DE LA  
STATION

DIVISION "MESURE-INFORMATIQUE"

INFORMATIQUE : Madame GAO Hei-Jiuen  
Mademoiselle CHENG Pei-Houa

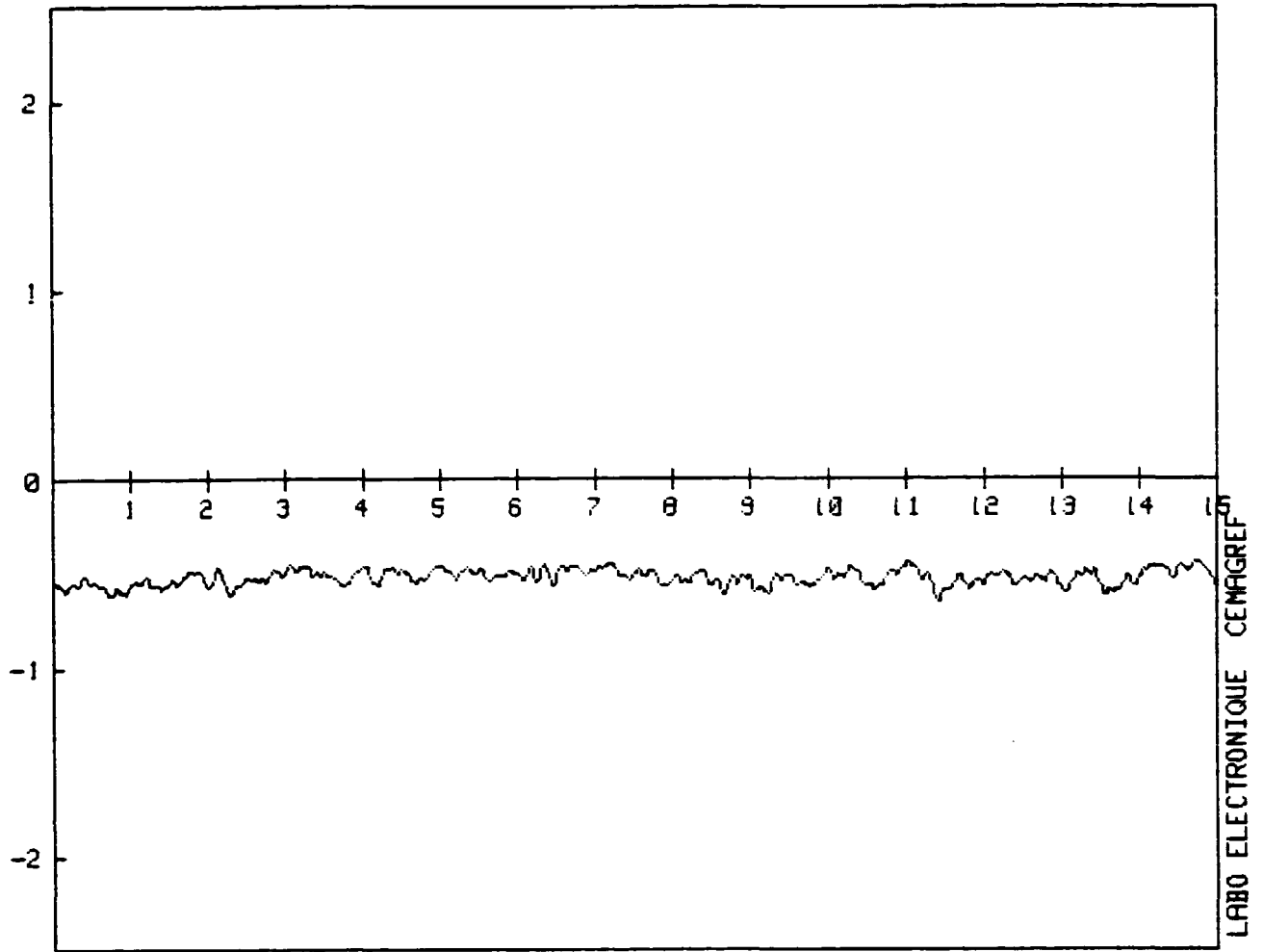
MESURE-TELEMESURE : Mademoiselle CHEN Shan  
Monsieur LI Bi-Chi  
Mademoiselle CHEN Hai-Yien

DIVISION "TRACTEUR"

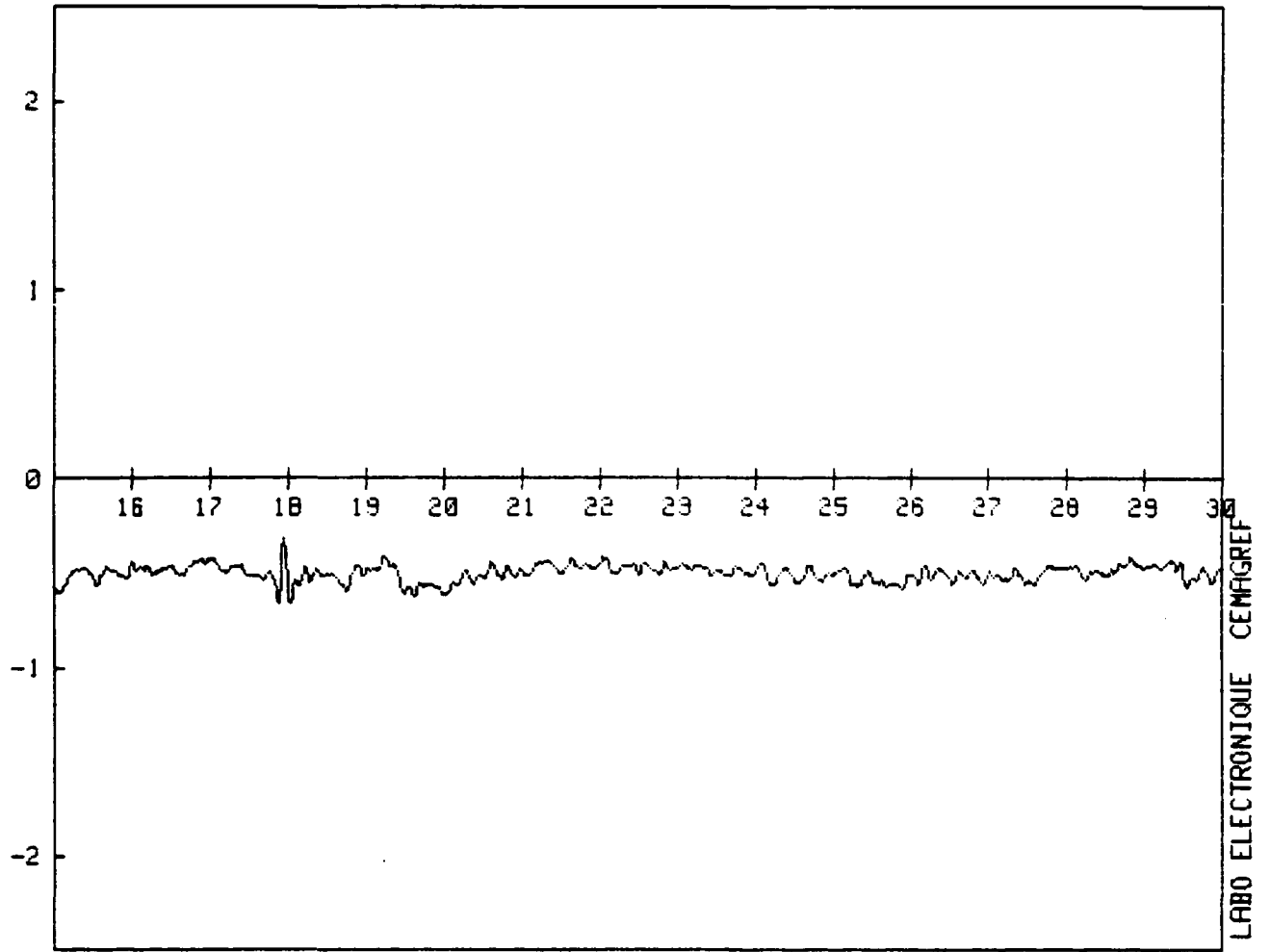
Monsieur LI Xi-Jiang (stagiaire venu en FRANCE)  
Monsieur WANG Yuan-Xiang (stagiaire venu en FRANCE)  
Monsieur LI Zhen-Hong

ESSAI N° 10 BASE N° 3 VOIE N° 0

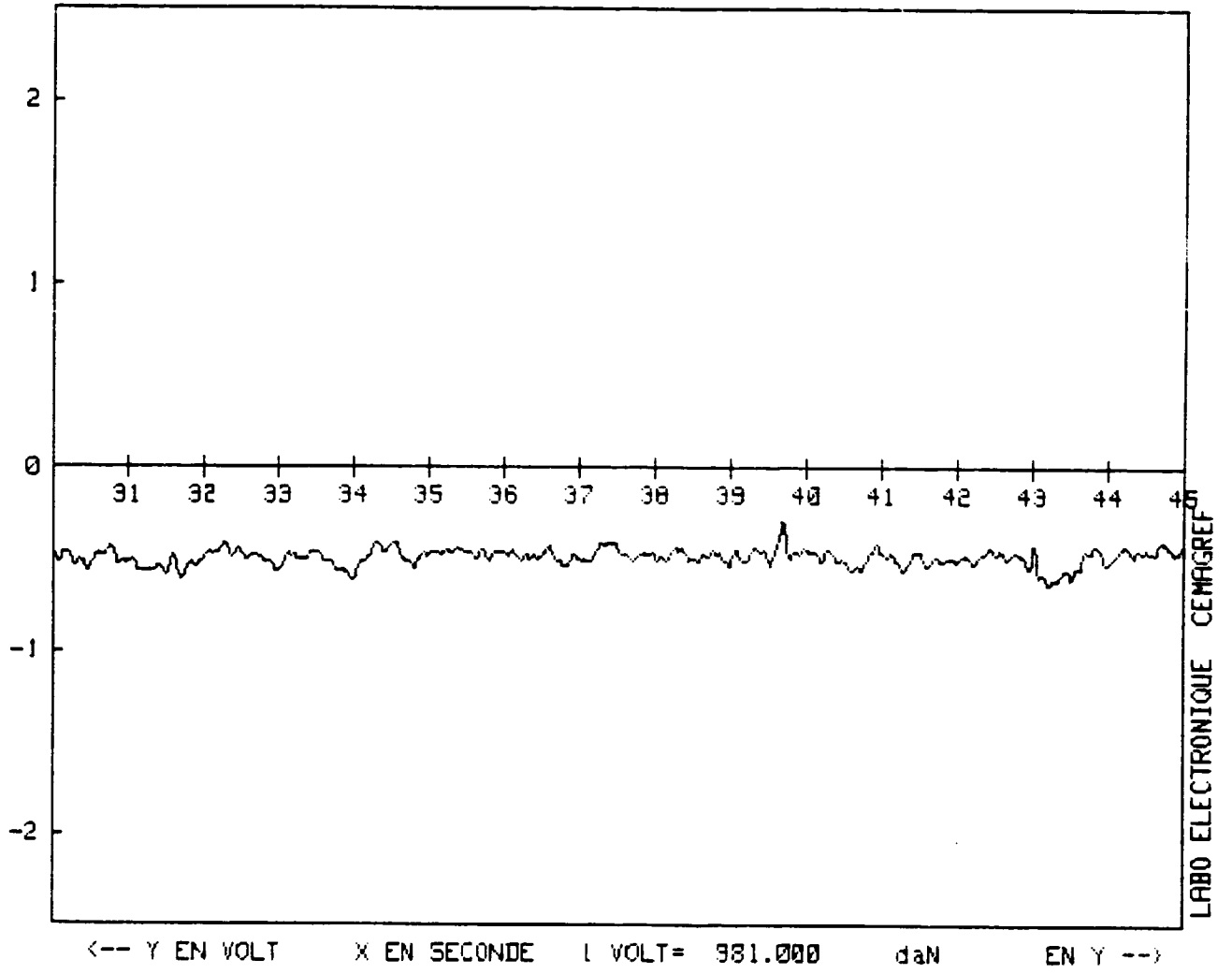
PAGE N° 1

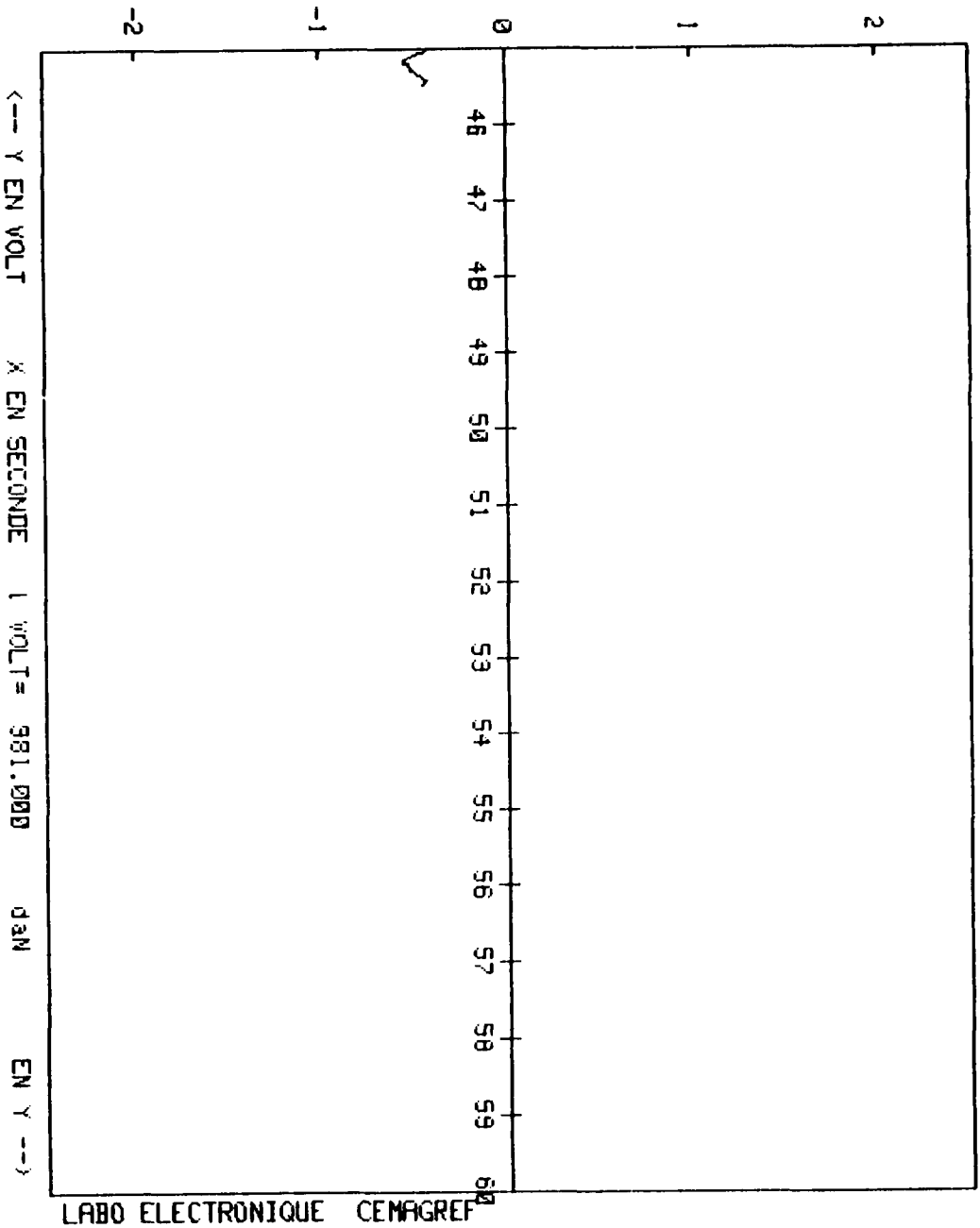


<-- Y EN VOLT      X EN SECONDE      1 VOLT = 981.000      daN      EN Y -->



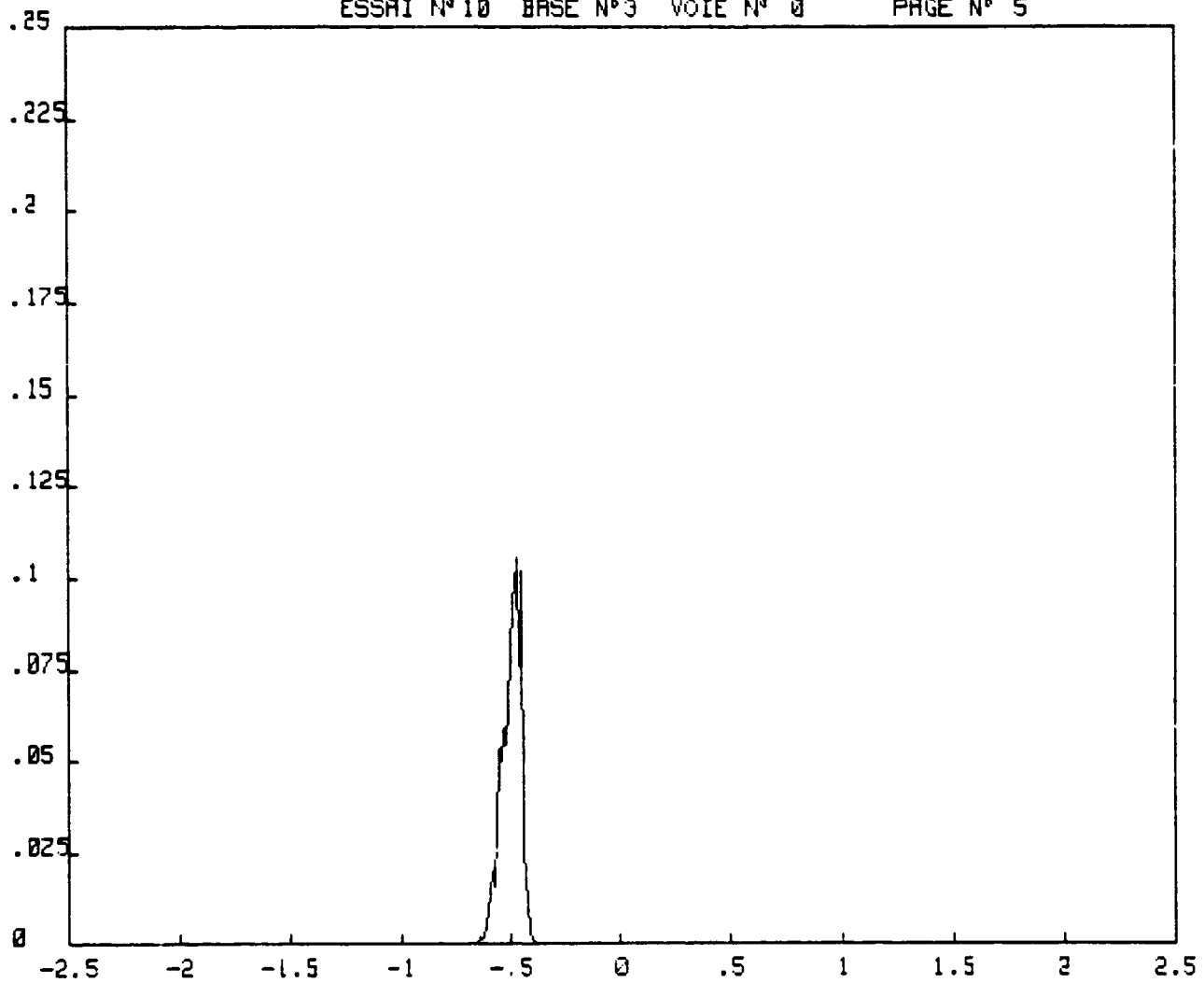
<-- Y EN VOLT      X EN SECONDE      1 VOLT= 981.000      daN      EN Y -->





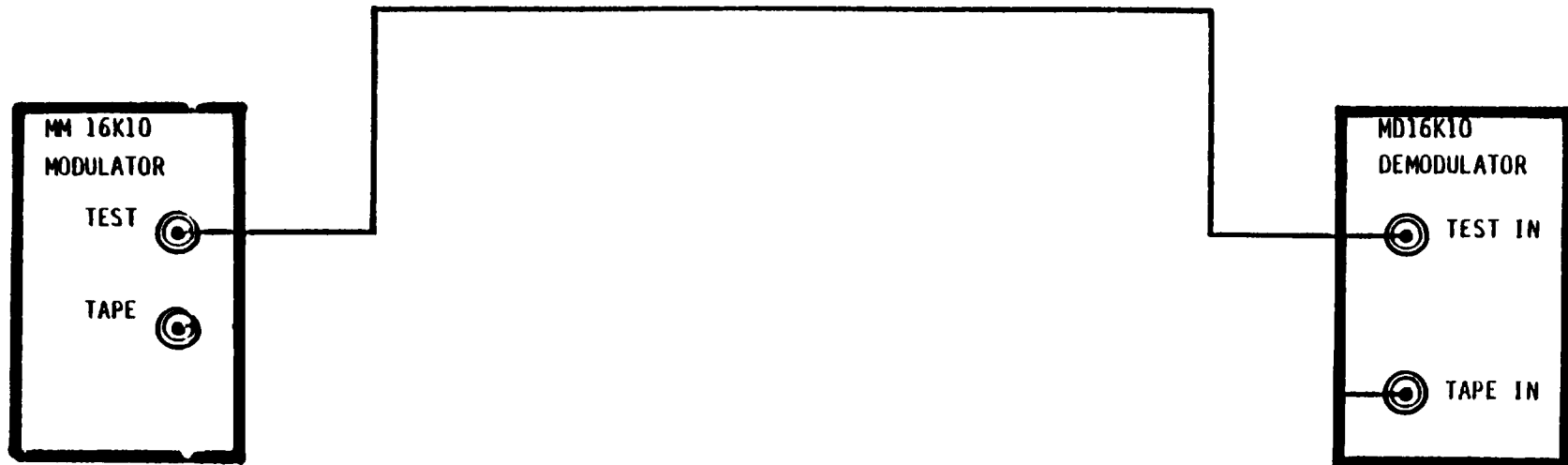
DATE : 12/01/83      LIEU : CHALOU MOULINEU  
ESSAI N° : 10      BASE N° : 3      VOIE N° : 0  
CALIBRATION : 1V = 981.000 daN  
MOYENNE :      -.506 V      -496.0768 daN  
EC.TYPE :      .043 V      41.9157 daN  
MAXIMUM :      -.294 V      -287.9648 daN  
MINIMUM :      -.656 V      -643.1213 daN  
CONSUMMATION : 193.00 CM3      15.277 l/H  
      12832.579 g/H  
      .184 l/Ha  
RAPPORT VITESSE 3G2 2.2683  
ROTATION PdF 685.0 Tr/Mn  
ROTATION MOT 1553.8 Tr/Mn  
VITESSE TRACT 3.958 Km/h VITESSE THEORIQUE : 4.703  
DUREE 45.48 S ERR SYNC 0 PAS LECT 10  
GLISSEMENT .158  
COEF FILTRE 1000 NB CFILT 0  
LABO ELECTRONIQUE CEMAGREF





INSTALLATION DE LA CHAINE DE MESURE ET DE L'ENREGISTREUR MAGNETIQUE : LIAISON DIRECTE.

USING ONLY TEST INPUT- OUTPUT.



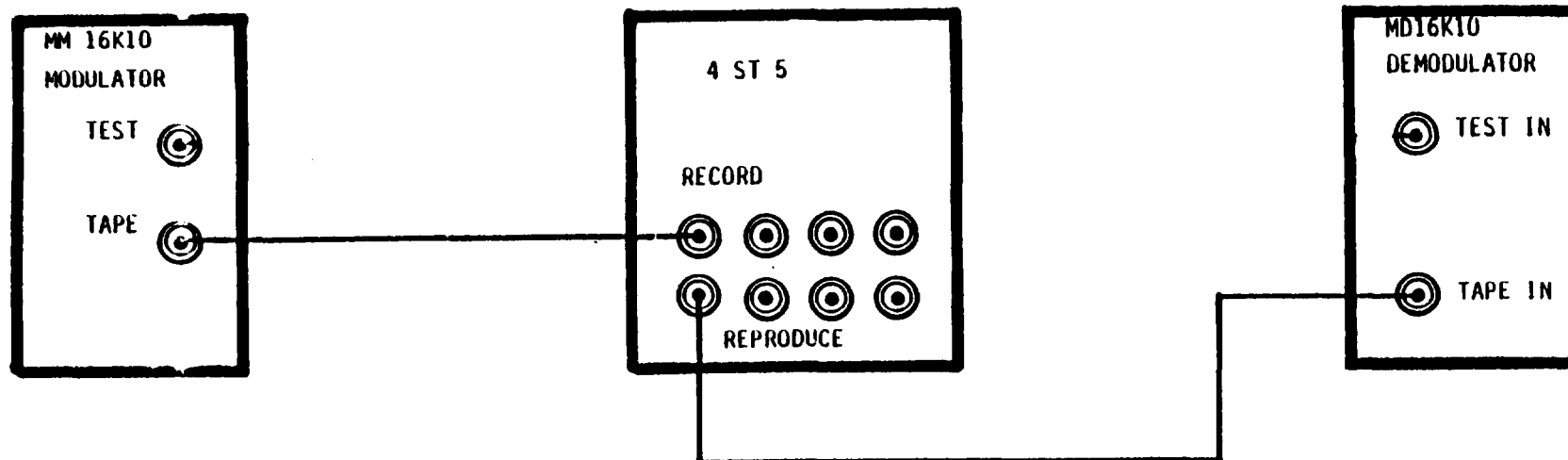
ANNEXE N° 6

35

**CEMAGREF**  
Parc de Tourvoie  
97140 Antenne Tel. 666 21 01

INSTALLATION DE LA CHAÎNE DE MESURE ET DE L'ENREGISTREUR MAGNETIQUE : LIAISON DIRECTE.

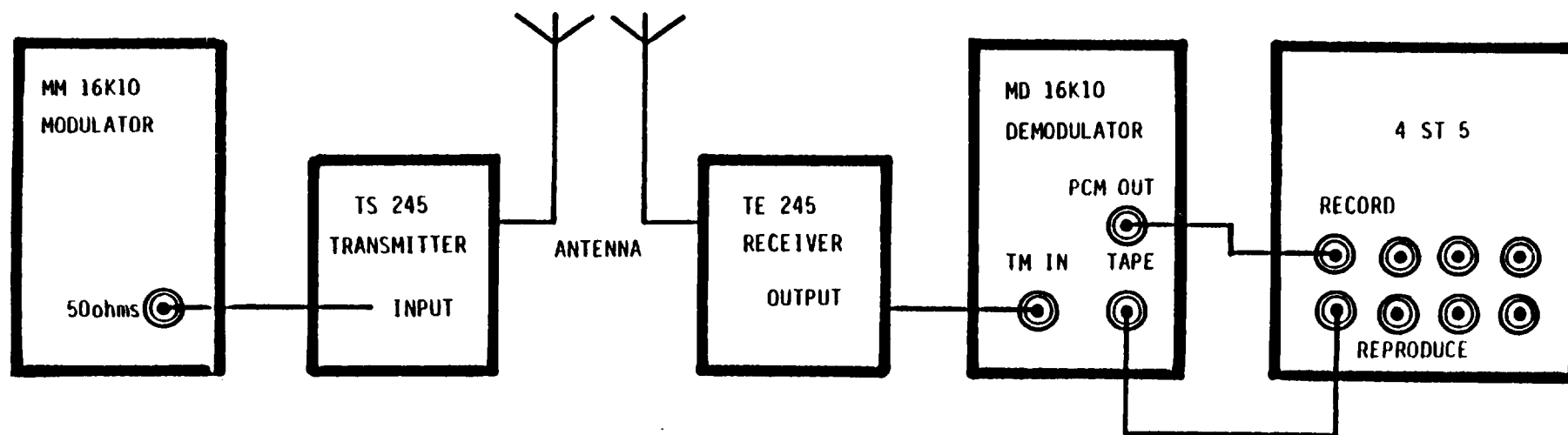
USING ONLY 4 ST 5



35

INSTALLATION DE LA CHAINE DE MESURE ET DE L'ENREGISTREUR MAGNETIQUE : TELETRANSMISSION.

...USING TELEMETRIE AND 4ST5...



14162  
(3 of 4)

Project for the China Agricultural  
Machinery Testing Centre of  
Beijing (China)

---

United Nations Development Programme :  
Project DP/CPR/80/017

Contract concluded with CEMAGREF  
for the project implementation  
(United Nations Organization for  
Industrial Development : contract T81/23)

---

MISSION TO CHINA BY Mr Jean-François BILLOT  
September 23 rd to october 21 st 1983

---

Report by the consultant specialized  
in field test of farm equipment

Project for the China Agricultural  
Machinery Testing Centre of  
Beijing (China)

---

United Nations Development Programme :  
Project DP/CPR/80/017

Contract concluded with CEMAGREF  
for the project implementation  
(United Nations Organization for  
Industrial Development : contract T81/23)

---

MISSION TO CHINA BY Mr Jean-François BILLOT  
September 23 rd to october 21 st 1983

---

Report by the consultant specialized  
in field test of farm equipment

C O N T E N T S

INTRODUCTION

- I Operation of the measuring instruments supplied within the contract.
- II Field test of a chinese-made rotary cultivator
- III Teaching activity of the consultant.
- IV Role of the centre in equipment evaluation. Recommendations on means and methods to be used for equipment field testing.

CONCLUSION

APPENDIXES : I Texture triangle

II Test of soil working equipment

- II a - Measurement to be carried out
- II b - Presentation of a report stating the performances of practical work
- II c - Copy of the IGN 200 rotary cultivator test report.

III Tests of combines

- III a - Measurements to be carried out
- III b - Presentation of a test report

IV List of persons taking part in the seminars organized by the consultant

V Daily report of the consultant during the mission

## INTRODUCTION :

This mission was organized within the framework of the contract between UNIDO and CEMAGREF in order to equip China with a National Agricultural Machinery Testing Centre adequately furnished with measuring equipment and qualified people to carry out tests on farm machines which could be useful to Chinese agriculture.

This mission was complementary to the consultant's contribution to the definition of the instrumentation needed, and to the training in France of three engineers of the Chinese Centre from August 1982 to January 1983.

The task to be carried out was defined as follows :

- advice on the more performing methods for the testing of farm machines (particularly combines and tillage equipment).
- advise on the choice of tillage equipment to be used according to crop and soil characteristics.
- advice on methods used to determine the soil's physical state before and after tillage .
- organization of seminars on subjects which could be useful for the testing and the evaluation of farm machines.

The whole mission took place in Beijing the work being shared during a part of the period by Mr. BOUHAGEB and Mr. MECHINEAU respectively in charge of the bench tests of tractors and walking tractors and measuring electronics and computerized systems.

This report reviews the main activities of the consultant during his stay the chapter headings do not correspond to any chronological order (for this the daily report enclosed in appendix).

First the implementation of the measuring instruments supplied will be presented then the test of the tillage equipment then the training given and finally the analysis made by the consultant together with a few remarks on the role of the Chinese Testing Centre as far as field tests are concerned.



## I - IMPLEMENTATION OF THE MEASURING INSTRUMENTS SUPPLIED WITHIN THE CONTRACT

The measuring equipment provided and useful for field testing of farm machines is divided into two categories :

### - Equipment fitted on tractors or farm machines :

Force measurement : traction - compression sensors           SEDEME  
                                  dynamometric hitch bar           CEMAGREF  
                                  amplifier                     SEDEME

Torque measurement : torque meter REILHOFER  
Fuel consumption    : fuel meter EMERSON - BROOK

Travelling speed measurement : radar RDS

Rotation speed measurement : proximity sensors : ROGO  
box with totalizing counters and chronometer : ROGO-ZIVI

Multichronometer                    : KIENZLE

### - Soil characteristics measuring equipment :

Resistance to penetration : penetrometer SATTEC  
recording penetrometer    : CEMAGREF

Quick measurement of moisture : moisture meter SATTEC

All this equipment was presented in detail to the Centre's specialized staff and to the persons attending the seminars. This equipment was used by the Centre's staff under the consultant's supervision on various occasions : for calibration and during field testing of the rotary cultivator IGN 200.

### Pull and torque measurements :

The equipment in use is extensometric. The torque converter supplied (TS 106 SEDEME) is very versatile : it can be used on sensors incorporating 4 strain gauges (traction-compression sensors and dynamometric bars provided) or sensors including 1 or gauges when the constraints are to be studied within the structure of a machine. The torque meter Reilhofer is supplied with its own amplifier and delivers a current of 2 Volts when the torque reaches 1000 N.m. It is completed with a tachymetric device which delivers a current of 5 Volts for a rotation speed of 2000 rpm. This torque meter has been calibrated through the SCHENK brake of the tractor testing bench during one of the training sessions dealing with measuring devices. The training sessions also dealt with the use of dynamometric drawbars : a test rig permitted one to check their reliability through measurements of simulated pulling in an oblique direction.

Consumption measurement :

The fuel meter is mounted on the engine fuel system taking the leakage pipe into account so that only the fuel actually consumed is measured. A chronometer and a digital display of the fuel consumption volume are placed in a box located near the dashboard.

Field consumption measurements can give valuable information concerning the power required to carry out a tillage operation with an implement. The energy requirements of several tools used for the same tillage operation can also be compared. For this type of comparative measurements it is advisable to carry out operations with the same position of the engine governor in order to select the correct power and fuel consumption curves versus engine speed obtained during the tractor complete bench test at the power-take-off.

Forward speed measurement :

The equipment used is a Doppler radar. It gives one impulse per travelled meter. The variations of travelling speed in the field can be drawn from the recording of this signal versus time. The speed in km/h is also directly read on a dial. The accuracy of these various measurements can be checked by using a chronometer on a given length (often 50 m).

Measurement of the rotation speed of rotating shafts :

The proximity sensors used give an impulse when a metallic body is within their range. The rotating shafts are equipped with annular gears with "n" teeth, which enables to get "n" impulses per revolution (usually it is useful to choose a multiple of 6 for "n" in order to obtain almost straight away the number of revolutions per minute from the impulse per second figure). These data are either recorded or displayed on totalizing counters housed together with a chronometer in a multi-purpose box.

Automatic recording of working times

One may need to know in detail the various field operations carried out by a tractor and to record their respective duration. It allows one to determine the wear and tear of precise mechanical parts according to their actual operating time.

The KIENZLE equipment supplied provides the opportunity to record the position (on or off) of various switches on a paper disc which makes a complete revolution in 12 hours. These switches have been arranged on the tractor in order to indicate the position of the main controls (power-take-off engagement lever, gear shift lever, hydraulic lift hand lever, etc...), and therefore the tractor use.

Penetration resistance :

The measurement of the penetration resistance of a soil is used as a reference when comparing various tillage implements in different soils or in the same soil at different moisture contents. Two types of penetrometers have been supplied : one from the SATTEC indicates a precise value of the penetration resistance at different depths ; another one from CEMAGREF gives a curve of penetration resistance versus depth and allows one to point out quickly the vertical heterogeneities of a cultivated soil.

Moisture content measurement :

The mechanical characteristics of the soil vary considerably according to its moisture content. Therefore it is important to measure the moisture in order to determine the soil state when the test is carried out. The SATTEC equipment provides the opportunity to obtain the result when in the field.

II - FIELD TEST OF A CHINESE MADE ROTARY CULTIVATOR

The IGN 200 rotary cultivator, manufactured by the Agricultural Machinery Plant of the GUAN YUN county (KIANGSU Province), was used for the test.

1°) Preparation of the agricultural and the measuring equipment.

The Tie Niu 65 tractor has been equipped with several measuring devices supplied within the contract :

- consumption meter : fuel consumption measurement
- torque meter : measurement of the torque delivered at the power- take-off and the rotation speed of the power-take-off shaft.
- radar : actual forward speed measurement
- proximity sensors attached to each tractor rear wheel : measurement of the wheel's rotation speed.

The mounting of the consumption meter, as well as the radar and the proximity sensors gave rise to the manufacture of matching pieces (sensors, supports and a 36 teeth plate attached to each rear wheel ).

The telemetry system has been installed on the tractor (emitter) and on a specially fitted vehicle (receiver and recording unit).

2°) Carrying-out of the test

The test took place on September 29 1983 near the Testing Centre in a seed production field of the Xin Sheng production brigade (people's commune of Shi Li Dian, Beijing).

Maize previously cultivated in this field had been harvested by hand a week before and the field was left with stubble and weeds. The clay loam soil tilled had a water content expressed in % of dry matter slightly below the field capacity (16,2 % against about 18 % for this type of soil).

Measurements were carried out on strip 50 m long, the tractor operating at two different forward speeds corresponding to the slow third and fourth gears, the rotation speed of the tool's rotor being the same in both cases. The slip for each selected gear can be calculated by raising the tool and running the engine at the same rotation speed as when at work. The values measured by the sensors were radioed to the telemetry vehicle parked on a lane near the field and recorded on tapes. A generating set supplies with 220 V the telemetry receiving equipment and the magnetic recorder.

The following items are thus continuously recorded for each measurement strip :

./.

- the torque at the power-take-off (tension)
- the power-take-off rotation speed (tension)
- the rotation speed of right and left rear wheels (frequencies)
- the fuel consumption (frequency)
- the real forward speed (frequency).

An operator in the tractor's cab starts and stops the fuel meter and the chronometer at the beginning and at the end of the measurement base plotted on the field by stocks.

These measurements on the tractor were completed by measurements aiming at characterizing the tilled soil and the effect of the tool tested :

. the soil resistance is measured with a penetrometer at three depths.

. the soil loosening, the tillage depth and the weed incorporation were measured with teams of the Centre according to the methods commonly used : (see photos n° 6, 7, 8 in Mr. Janin's report)

- loosening is measured by comparing the soil levels before and after the passage of the tool using the reference level of a horizontal bar. The working depth is measured with this bar as a reference, after taking out the layer of crumbled soil ;

- the incorporation of maize stubble and weeds is considered as an important characteristic of the implement effect in a country in which very few herbicides are used. Such an incorporation is estimated by calculating the difference between the vegetable matter available on 1m<sup>2</sup> area before the passage of the tool and the remaining vegetable matter on the tilled soil after the passage. The value in % is calculated after weighing the vegetable matter obtained with the scissors (everything above ground level is cut).

. Soil samples are made to determine the moisture content in an oven and to carry out a granulometry analysis.

### 3°) Remarks on the results obtained

A certain amount of data was collected in the field : particularly the data concerning the soil, the effect of the tool on the soil (quantitative measurements together with qualitative remarks) as well as the fuel meter readings and the values given by the chronometer.

The data recorded on tapes were analyzed in laboratory on a programmed scientific computer (supplied within the contrat). Thus, a display of the signal variations, its maximum, minimum and average values, is obtained together with presentation in a histogram form. The value of the average slip is calculated.

Remarks on the values obtained (see test report in appendix).

#### Working depth

This depth corresponds to the maximum for a tillage tool whose depth of operation is not limited by wheels or skates. The 14.5 cm depth reached is more regular at a low forward speed (2.24 km/h than at a high one (4.11 km/h). The bottom of the tilled layer has a flat and smooth aspect.

#### Loosening

Loosening is greater at a high forward speed than at a low one for the following main reasons : the crumbling is lower (see qualitative remarks), bringing about higher porosity and also power surface levelling (see diagrams).

#### Slips

The values obtained are negative ones (- 1.6% and - 2.4%), which often occur when this type of tool is used in sufficiently cohesive soils (such is the case : the penetration resistance being about 4.4 kg/cm<sup>2</sup>), as the rotor which rotates in the forward direction tends to push the tractor. Part of the 32.94 daN.m and 41.55 daN.m was drawn from the p.t.o. torque to contribute to the tractor's forward movement.

#### P.t.o. torque

The figures obtained with the selected p.t.o. rotation speed correspond to an average power supplied about half of the maximum possibilities of the tractor used (20 and 25 kW against 41.8 kW). Therefore, this tool could be used either with a less powerful tractor to carry out the same operation or in a more cohesive soil with the same tractor.

#### Incorporation of the vegetable cover

This incorporation was better at a low speed than at a high one (99 % against 86 %) but is such a difference sufficient to involve a significant

./.

change in weed regrowth ? One can have doubts about the result considering the low incorporating depth (from 0 to 14 cm).

4°) Remarks on the report drawn up from the test (see appendix)

Description of the tool tested (p. 2) :

- Few information on the working parts of the tool are available :
- What is the rotor diameter ? What is the forme of L. shaped blades ?  
A drawing would be required. What is their positioning ?
- The rear shield is neither mentioned nor its use during the test. On the other hand the information given in table 2 (concerning temperatures during the p.t.o. test of the tractor used) do not seem to be useful for understanding the field test results of the soil tillage implement. Table 1, for the torque units, N/m should be read N.m. The unit symbol should be mentioned in the table "Position of the gear lever" (probably km/h).

Conditions prevailing during the tests (p. 3)

The soil type would be better characterized if results of a granulometric analysis were presented.

Test results : (p. 3)

Giving the formula used to calculate the unevenness index of working depth (S) would allow one to get a better idea of the index variation signification. It should perhaps have been necessary to complete the qualitative remarks on the soil (crumbling) by some measurements (such as clod sieving ? or photo analysis of soil surface through a standardized grid ?) which would allow one to estimate the crumbling so that it could be determined as sufficient or not by comparison with a threshold value.

As far as possible, the official units should be used and the values in common units (hp, rpm) should be given in brackets. A conclusion, in which remarks are made upon the value of the tested equipment, should be added to the report.

### III. TEACHING ACTIVITY OF THE CONSULTANT

Four whole days were dedicated to seminars attended by the specialized staff of the national Centre, as well as engineers and technicians representing the various local testing stations.

October 6 : seminar on tests of tillage implements : quantitative and qualitative aspects.

- Presentation of testing methods used in France for various tillage implements, with particular emphasis on the reasons for the test. These can determine which procedure to follow, since tests are not compulsory for this kind of tools. The test may be used simply to check the characteristics and field operation of the implements, according to a preestablished protocol when, for instance, manufacturers need to obtain a performance-test report in order to tender for public markets or to export equipment which has already been successfully used by farmers. More complete tests can be carried out from the agronomical point of view in order to determine the range of use of a new tool. New machines can be designed and developed through real cooperation with manufacturers. When there is no standardized test-protocol available, one can be drawn up by the manufacturer on a case-by-case basis.

- Presentation of various examples of real tests and of a standard framework for a performance test report.

- Slide show of observation methods of :

- . tools in operation
- . work carried out by tools : in surface tillage (pictures taken through a standardized pattern and in deep tillage (soil profiles)
- . profiles of soils during plant growing process.

- Presentation of present research in this field (macrographical studies based on thin soil slices impregnated with polymerizable resin, precision penetrometry). Application of those new methods to studies related to agricultural soil conservation.

- Presentation of the usefulness of soil maps and of the classification of soils according to their granulometric composition based on laboratory results and on the interpretation of tactile sensations ; use of texture triangles (see appendix).

- Presentation of a simplified test method for defining the energy requirements of a specific tool through the measurement of fuel consumption and p.t.o. rotational speed. The data is collected by totalizers fitted in a case with a chronometer (these instruments are included in the contract).

During the seminar, it was possible to show slides of various tillage implements and to explain their function in various conditions of cultivation (soils, climate, crops). Examples were taken in France and in Mediterranean countries, with references enabling participants, who came from a wide range of regions, to relate the use of a particular tool to the pedo-climatic conditions that prevail in their own regions.

October 10 : seminar on tractor-tool connections and presentation of the demonstration test carried out while Messrs. WANG, XIE and LI were in France.

- Aim of the test :

- show the potential of the measurement equipment and of telemetry for the recording of numerous data,

- give information to tractor (Renault) and plough (Huard) manufacturers regarding the stress undergone by their machines when they are used in a new combination (towed plough and pushed plough).

- Presentation of the test, of the equipment used (a part of which constitutes the object of the contract), of the measurement methods used. Study of the measurement procedure and of the information derived from the automatic analysis of recorded data.

- Analysis of a few results in order to understand the operation of the tractor-tool unit.

- Presentation of various aspects of the tractor-tool connection : standardization, power transmission, implement compatibility.

October, 13 : seminar on the testing methods for combines.

- Presentation of the purpose of a combine test underlining the machine performances.

- Presentation of the structure of a test report (see appendix).

- Analysis of the various circuits of the machine and of the measuring equipment used in the test of machine components (fuel meter ; rotation sensors fitted to the engine, the threshing drum, the fan and the reel).

- Precise definition of the test conditions (weather conditions, conditions of soil and harvest.

- Presentation of the losses evaluation method : use of a small combine.

This seminar was illustrated with slides taken during individual tests or on the occasion of a comparison between various machines, which had been set up by a group of farmers. The seminar ended with a presentation of the technical specifications of the machines recently marketed in Europe as well as of the electronic control systems commonly fitted to some types of highly productive machines.

October 17 : seminar on fatigue tests of agricultural equipment.

- Presentation of the objectives of the fatigue tests : they aim at using a machine during a rather long time in order to estimate its resistance capacity as well as its general reliability and the reliability of its various components. The test may apply to the machine as a whole or to certain parts of it that are considered as more fragile or subject to greater stress. In general this sort of test is carried out by the manufacturers trying to



improve the equipment reliability. Therefore, it is more important to locate the weaknesses of the machine rather than deciding whether it is efficient or not. By this kind of test the manufacturers are also in a position to assess the life-time of the various components as well as the replacement period of faulty parts.

- Presentation of long-term tests carried out at the CEMAGREF on behalf of manufacturers or included in standard tests.

- Presentation of a long-term collaboration project between a testing station and a manufacturer aiming at developing new equipment, problems entailed, duration of the project.

- Presentation of various methods used by the manufacturers for these long-term tests for tractors, combines, implements for tillage operations : laboratory simulation devices, rough testing tracks field tests...

- Presentation of fatigue strength tests : alternative stress resistance analysis of internal stresses through real operation recording, in order to drive long-term tests carried out in a laboratory (counting and simulation method).

These various presentations were illustrated with slides taken in factories and testing organizations as well as views related to the counting and simulation methods applied.

#### IV - ROLE OF THE CENTRE IN EQUIPMENT EVALUATION. RECOMMENDATIONS ON THE MEANS AND METHODS TO BE USED FOR EQUIPMENT FIELD TESTING.

##### Role of the Centre in equipment evaluation :

According to a note by Chief Engineer TU SINGHENG (1), the role of the Centre can be described as follows :

Situated near Beijing it plays a part on a national scale complementary to that of the 26 testing and evaluation stations located in the provinces, towns and independant regions. It takes part in successive actions taking place during the manufacturing process of a new agricultural machine :

1. Evaluation of the prototype
2. Evaluation of the pilot equipment
3. Evaluation of the distribution of the standard or pilot equipment
4. Large scale distribution of some machines
5. Regular checking of the production quality of several mass-produced models of the same type
6. Evaluation through surveys of the preservation of the good quality of the original product.

The first two phases take place before the mass production process, operations 5 and 6 being carried out during the process itself. For some machines the large scale distribution follows the first three evaluations, the third one contributing to the adaptation of the prototype and standard equipment in the various regions where it has been distributed.

The consultant collected further data on the systematic and compulsory tests for all the machines manufactured in China.

The factory - manufactured equipment is supposed to be tested by the station of the province in which the factory is located. The National Centre seems to intervene particularly for machines of national interest, including ones which can be used in all the provinces, such as tractors and combines, machines to be exported and imported equipment.

A certain standardization seems to prevail as far as the evaluation methods of the prototypes and pilot equipment are concerned (phases 1 and 2). In most cases, two steps seem to be undertaken :

- first of all, the equipment is used during a short period (a few months) in order to see if it corresponds to agricultural needs.

- then during a longer time, the manufacturing quality of the equipment is evaluated.

A 2000 hour-test and a 1500 hour-test planned for tractors and two-wheeled tractors respectively = 80 % of the time is spent in an intensive use of the equipment (operating at 85 % of its maximum power) for heavy work (tillage), 20 % of the time being spent to lighter work (transports). As regards the four-wheel-drive tractors used in the rice fields the test would las 2300 hours the first 1500 hours during the first year being divided as follows : 800 hours for tillage, 400 hours for heavy harrowing and 300 hours for various post-harvest work (work on the farm, transports). The final purpose is the production of a high quality equipment meeting the needs of the Chinese agriculture.

---

(1) "Howto serve the users and industry", enclosed, as an appendix, to Mr. Janin's report.

The evaluation of equipment distribution (phase n° 3) would then be carried out in close collaboration with the farmers, in real practical conditions. Indeed, since the cropping systems vary from one region to another it is essential to evaluate whether the machine is well adapted to the needs of the region involved. It seems that efforts are made to set up experimental agricultural units in regions cultivating well determined crops. These units, together with the farmers, would set out practical tests designed to underline the advantages the users would draw from the machine. They would also aim at making widely understood the equipment's utilization and maintenance techniques.

It is important to recall that the Chinese farmers have been in a position to choose their equipment themselves since the implementation of the new "*responsability system*". Therefore the quality of the machines has to be good and this must be ascertained by the farmers if stocks of unsold equipment are to be avoided.

This is precisely the goal of the present test procedure mentioned above but it takes quite a long time to carry out (more than a year) and causes significant delays in the output of new equipment, which is contrary to the interests of the Chinese agriculture. Thus, while keeping high-standards in the test procedure, means and methods should be designed in order to limit such delays.

#### Recommendations on the means and methods to be used for equipment field testing.

In phases 1 and 2 of the evaluation procedure, the method used so far emphasized full-load uses (80% of testing time). A great deal of time could be saved by systematically selecting very rough conditions of use (transport on rough terrain ploughing in dry clay soil etc.). During the tests as many measurements as possible should be made to determine the stress undergone by each component of the machine in field operations. Such measurements could be made with the telemetry equipment the Centre is now provided with. In this way, the response of the various mechanical components could be assessed with precision. By calculating the real stress undergone by the equipment in the field, one could also establish control programmes for the hydraulic jaks that the testing benches are fitted with.

Field- tests could thus be supplemented by laboratory bench-tests. This would save time by removing restrictions linked to crops or weather. The equipment fatigue strength could be much more easily estimated and the durability of its various structural components could be calculated.

In order to decide how the equipment should be distributed it is necessary to know exactly how farmers intend to use it. Performance requirements vary, for exemple depending on whether the tractor is used for tillage or towing a trailer, or as a stationary unit for driving an irrigation pump.

A study should make it possible to determine the main types of mechanized cultivation systems and to identify the equipment that is best suited to each type and how to use it. Very accurate information can be derived both from time of operation recordings made with devices such as possessed by the Centre and from quick fuel consumption measurements made on the farmers equipment while

operating in normal conditions. The study would be carried out in close collaboration with the testing stations in the provinces. It would give emphasis on the safety of farm machine users in real conditions of use.

If such a testing and distribution control policy is to be carried out, a wide training programme for the present staff ought to be set up in order to achieve homogeneity in measurement methods. This policy could be brought about in each province under the aegis of the local testing station.

Phases 5 and 6 (checking of equipment quality) seem to encompass checkings that in France, are usually carried out by the manufacturers themselves. It is in their interest to check severely the quality of their products since they are bound to their customer-user by a guarantee contract.

It could be argued that if the China Machinery Testing Centre gave up checkings that should be made by the industry, it would have more time to spare for agricultural mechanization. The Centre could, in particular, work in close collaboration with the Academy of Agricultural Machinery to design and develop new machines well-adapted to and much required for the needs of Chinese agriculture.

#### CONCLUSION :

The mission was carried out to the satisfaction of both parties.

The equipment was used without any major problem and was tried out by the specialized staff of the Centre for tests under real conditions during the consultant's stay. A complete test of soil-tillage implements, including preparation of the testing equipment, field data recording, data analysis by means of a programmed scientific computer, drawing-up of a Test Report, enabled the staff of the Centre to become familiar with and get the feel of the measurement equipment as well as of the testing methods. All the methods that were thus developed could be standardized and used throughout China by the local testing stations in the provinces.

The consultant particularly appreciated the seriousness, cordiality and efficiency of the people he came to know during his mission. He wishes to thank all his Chinese partners, in particular Mr XIE YAN MOU for his efficient help during the tests, the interpreter, Mr ZHANG CUNJIE for his remarkable work during the seminars, and Mr TU BINGHENG for the invaluable help he provided for the understanding of the testing Centre problems and for his outstanding efficiency in organizing the consultant's stay.

## ANNEXE I

=====

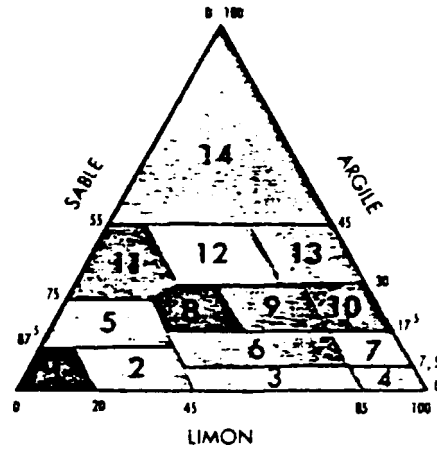
TRIANGLE DE TEXTURE

=====

**Textures**

Chaque couleur est représentative d'une texture, et les limites en sont figurées dans le graphique triangulaire en fonction des taux d'argile (inférieur à 2 microns), limon (2 à 5 microns), sable (50 microns à 2 mm).

- 1 - Sable
- 2 - Sable limoneux
- 3 - Limon léger sableux
- 4 - Limon léger
- 5 - Sable argileux
- 6 - Limon moyen sableux
- 7 - Limon moyen
- 8 - Argile légère sableuse
- 9 - Limon lourd sableux
- 10 - Limon lourd
- 11 - Argile sableuse
- 12 - Argile
- 13 - Argile limoneuse
- 14 - Argile lourde



Un des triangles de texture les plus employés en France (carte des textures des sols du département de l'Aisne).

ANNEXE II a

## DEROULEMENT D'UN ESSAI DE MATERIEL DE TRAVAIL DU SOL

=====

1°) Avant l'essai :

le sol . Description (Etat du sol avant le passage)  
 . Caractérisation  
 . Champ : pente, état de surface  
 . Humidité

l'outil - Description ( bâti  
 ) pièces travaillantes  
 ( mode d'action.

2°) Pendant l'essai :

- sol :  
 profondeur  
 largeur  
 volume travaillé

- machine :  
 efforts  
 couples  
 consommation en fuel  
 vitesse de travail.

3°) Après l'essai :

Résultat du travail .  
 (Photos avec échelle, dessins).

Surface  
 Emiettement  
 Retournement  
 Enfouissement  
 Tri des mottes.

4°) Matériel de mesure utilisé :

Compteur de fuel  
 de vitesse  
 de rotation prise de force (ou roues)

Mesures d'efforts  
 " de couple

Petit matériel : décamètre, règles graduées, clisimètre, jalons, chronomètre  
 quadrillage (maille 10 cm) 1 m<sup>2</sup> (pour photos de surface)  
 tamis de différents Ø, balance 5 Kg.

ANNEXE II bPRESENTATION D'UN BULLETIN D'ESSAI DE MATERIEL DE TRAVAIL DU SOL  
=====

- Nom et adresse de la station d'essai
- Numéro d'ordre
- Nom du responsable de l'essai
- Date et lieu de l'essai
- Tracteur utilisé
- Description du matériel essayé avec ses principales caractéristiques :  
  largeur théorique de travail, types de réglages possibles, mode d'attelage
- Conditions de travail : sol
- Relevé des courbes : couple, effort, etc...
- Tableau général présentant les valeurs moyennes les maxima et les minima
- Qualité du travail réalisé
- Observations sur le déroulement de l'essai, incidents
- Conclusion générale.

BULLETIN D'ESSAIS  
sur le fonctionnement d'un cultivateur rotatif

MODELE: IGN--200

LIEU DE FABRICATION: USINE DES MACHINES AGRICOLES  
DU DISTRICT DE GUAN YUN ,  
PROVINCE DE KIANGS'



STATION D'ESSAIS DES MACHINES AGRICOLES DU MINISTRE  
DE L'AGRICULTURE, DE L'ELEVAGE ET DE LA PECHE DE LA  
REPUBLIQUE POPULAIRE DE CHINE  
40 XIAO BA LI ZHUANG, DONG HUA' NAN LU, BEIJING  
Tel: 782649



## I. Machine essayée

Le cultivateur rotatif IGN--- 200 est entraîné par la prise de force du tracteur. Le mouvement est transmis au rotor par une boîte de pignons en position centrale. Il est doté de 58 lames toutes neuves en forme de crochet, et d'une dent travaillant en profondeur au milieu. Le poids total de ce cultivateur rotatif est de 394 kg, et sa largeur de travail théorique de 2m.

Tracteur utilisé: Tie-Niu 65. Un essai de ce tracteur à la prise de force a eu lieu précédemment. Les résultats en sont présentés dans les tableaux suivants:

Tableau 1

Tableau général de l'essai à la prise de force du tracteur Tie-Niu 65

Vitesse rotation ; (tr/mn)	Couple	Puissance à la prise de force ; (moteur)	Consommation en fuel
Prise de force ;	Prise de force ; N/m	Moteur ; N/m ; KW ; ch ;	kg/h ; g/ch.h ;
508.2	1459	796 ; 274 ; 41.8 ; 56.9	11.99 ; 211

Tableau 2

Conditions de l'essai à la prise de force

Température de l'air ambient ; 28°C	Température de l'huile ; 106°C
Température de l'air à la partie avant du radiateur ; 52°C	Température du gaz d'échappement ; 636°C
Température de l'air à l'entrée du filtre à air ; 42°C	Pression atmosphérique ( mb ) ; 1017
Température de l'eau à sortie du radiateur ; 54°C	
Température de l'eau à l'entrée du radiateur ; 78°C	
Température du fuel ; 31°C	

## Position du levier de vitesse:

I	; Lente ; 1.49 ;	IV	; Lente ; 4.13
	Rapide ; 6.91 ;		Rapide ; 19.06
II	; Lente ; 1.81 ;	V	; Lente ; 6.36
	Rapide ; 8.34 ;		Rapide ; 29.33
III	; Lente ; 2.23 ;	AR	; Lente ; 1.36
	Rapide ; 10.26 ;		Rapide ; 6.25

## II. Conditions de l'essai

Date d'essai: Apres midi du 29 septembre 1983.

Lieu d'essai: Station de semences de la brigade de production de Xin Sheng de la commune populaire de Shi Ba Li Dian de Beijing.

Culture précédente: Mais

Type du sol: Limon argileux

Humidité du sol ( % matière sèche ):

0---5cm	13.44%
5---10cm	16.19%
10---15cm	16.70%

Dureté du sol:

5cm	1.92kg/cm <sup>2</sup>
10cm	4.35 "
15cm	3.17 "

Couverture végétale: Chaumes du maïs et mauvaises herbes, environ 237.8kg par mu.

## III. Résultats d'essai

Matériel d'essai : L'essai s'est fait à l'aide des matériels entièrement et nouvellement importés des pays étrangers.

Selon les exigences de l'essai, les mesures suivantes ont été faites: couple de travail du cultivateur rotatif attelé par le tracteur, vitesse de rotation de la prise de force, vitesse d'avancement de l'ensemble, glissement du tracteur et consommation en fuel. Toutes ces données ont été enregistrées par les différents capteurs et transmises par un système PCM à un car de télé-mesure stationné au bord du champ. Ces données ont été ensuite dépouillées par un ordinateur.

## 1. Qualité de l'opération

L'essai s'est déroulé sur une base de 50m. La vitesse du tracteur choisie est la 3ème lente et ensuite la 4ème lente.

(1) Profondeur du travail: Voir tableau 3.

Tableau 3

<u>Profondeur du travail</u>						Unité: cm
3ème lente			:	4ème lente		
Mini.	Maxi.	Moyenne	:	Mini.	Maxi.	Moyenne
12	14.5	13.75	:	10.5	14	12.5

(2) Largeur du travail : Voir Tableau 4

Tableau 4

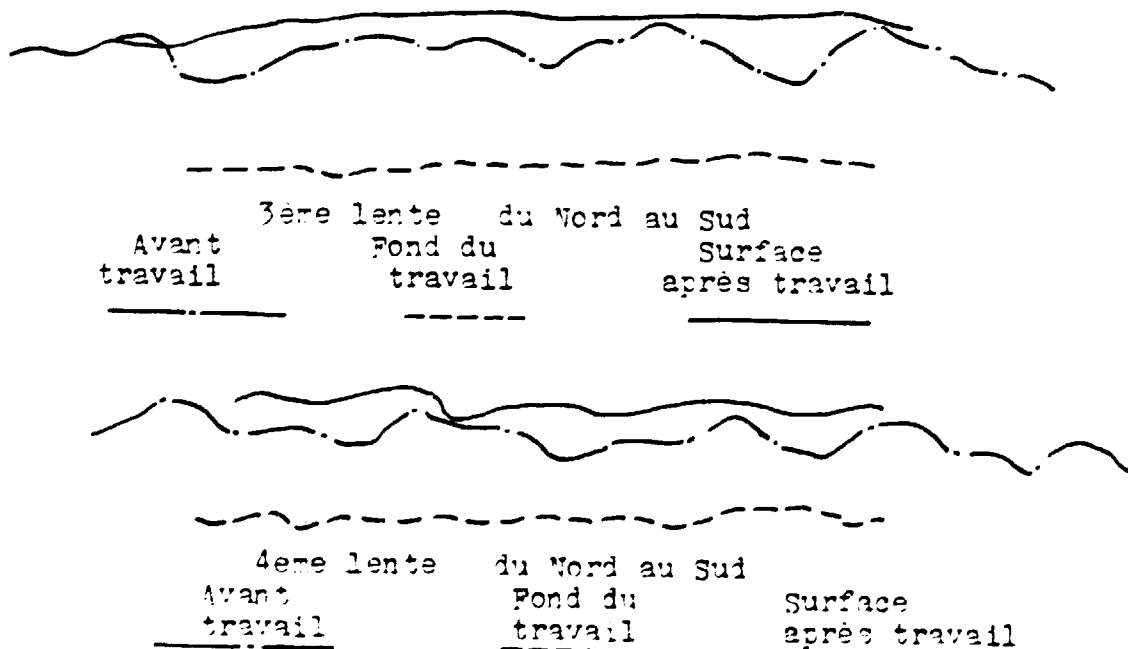
<u>Largeur du travail</u>						Unité: cm
3ème lente			:	4ème lente		
Mini.	Maxi.	Moyenne	:	Mini.	Maxi.	Moyenne
213	215	214	:	212	213	212.5

(3) Pourcentage de la couverture végétale enfouie:

3ème lente	98.55%
4ème lente	85.98%

(4) Degré de fissionnement du sol après le travail:

3ème lente	24.7%
4ème lente	41.26%



## (5) Inégalité horizontale du fond du travail:

En prenant pour référence le niveau de la profondeur du travail maximum, l'inégalité horizontale (S) du fond de travail est obtenue à l'aide de la formule de la différence normale:

3ème lente      S=0.62cm  
4ème lente      S=0.79cm

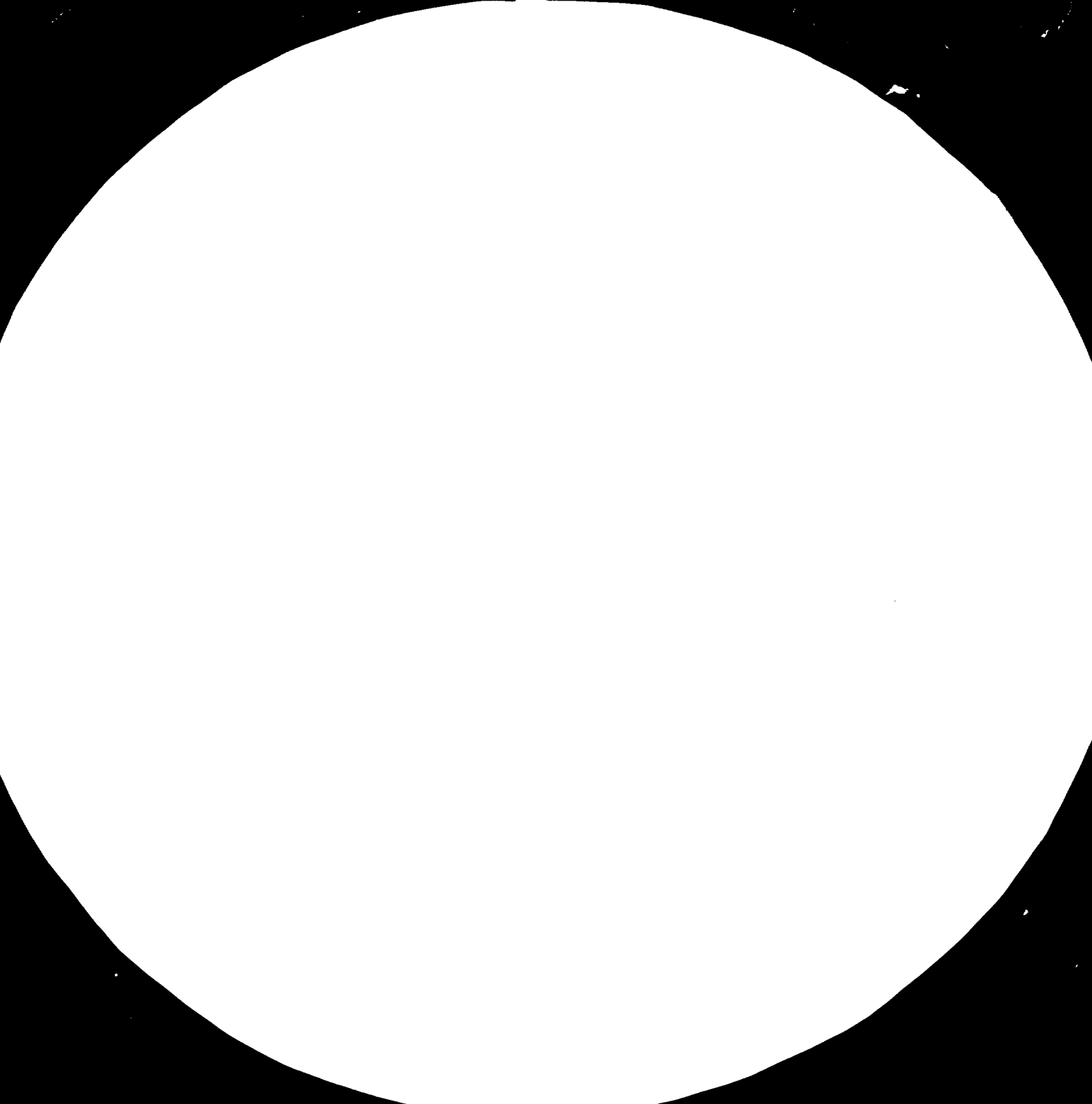
## (6) Émiettement du sol:

Le sol du champ d'essai est un limon argileux, et l'humidité de ce sol est convenable. La capacité de l'émiettement du sol du cultivateur rotatif est très bonne. Lors du travail de ce cultivateur rotatif, le sol est très bien émietté, on n'a donc pas estimé nécessaire de mesurer cet émiettement. Selon les résultats des observations, la qualité du travail à l'aide de la 3ème lente est nettement supérieure à celle de la 4ème lente.

## 2. Résultats des mesures énergétiques relatives au cultivateur rotatif

Tableau 5Caractéristiques énergétiques du cultivateur rotatif

Grandeurs mesurées	; 3ème lente	; 4ème lente
Couple ; Maximum (kgm)	; 69.66	; 82.84
Minimum (kgm)	; 3.92	; 7.55
; Moyenne (kgm)	; 32.94	; 41.55
Vitesse d'avancement (km/h)	; 2.24	; 4.11
Vitesse de rotation de la prise de force (tr/mn)	; 592.5	; 580.7
Vitesse de rotation du moteur (tr/mn)	; 1700.4	; 1660.0
Consommation en fuel ; l/h	; 9.294	; 10.520
; kg/h	; 7.714	; 8.732
Glissement du tracteur (%)	; -1.6	; -2.4





MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A  
STANDARD REFERENCE MATERIAL NO. 1010  
NBS 1010-B-1010 TEST CHART (1963)

ANNEXE III aDEROULEMENT D'UN ESSAI DE MOISSONNEUSE BATTEUSE  
=====1°) Avant l'essai :

Blé-céréales      Caractérisation :  
                          humidité du grain, nb de grains  
                          humidité de la paille, volume de paille

Champ :            Caractérisation :  
                  Sol : pente  
                          état de la surface du sol  
                  Adventices : types, importance.

Machine : Description complète.

2°) Pendant l'essai :

- Mesures en cours d'essai :  
    consommation  
    vitesse de rotation : .moteur  
    .ventilateur  
    .rabatteur  
    .batteur  
    .autre.

- Mesures globales :  
    rendement  
    pertes.

3°) Après l'essai :

Etat du grain récolté ; impuretés  
 paille battue.

4°) Matériel nécessaire :

Moissonneuse batteuse à essayer  
 batteuse pour pertes  
 bâches de récupération des pertes ou autre dispositif

Mesure : . compteur de fuel  
                  . compteurs de vitesse de rotation divers  
                  . pont bascule  
                  . boîtes pour humidité grain et pailles, étuves, balances  
                  . décimètre, clisimètre, jalons.

Divers : fourches, van, règles graduées, chronomètre.

ANNEXE III bCADRE DE PRESENTATION D'UN BULLETIN D'ESSAI DE MOISSONNEUSE BATTEUSE  
=====I Spécifications de la machineII Conditions des essais

- Conditions atmosphériques
- sol, pente
- récolte
  - espèce
  - aspect
  - plantes adventives
  - hauteur de la paille
  - teneur en eau grain
  - paille
  - masse volumique des grains
  - masse de 1000 grains

III Résultats des essais

- Vitesse
- hauteur des éteules
- pertes de grains
- pertes totales

IV Mesure du bruit.



ANNEXE IVLISTE DES PARTICIPANTS AUX SEMINAIRES ANIMES PAR LE CONSULTANT  
=====

## - Centre d'évaluation de matériel agricole de Pékin.

WANG SHIGUO  
 TSAN YEN KUA  
 XIE YAN MOU  
 LI BI ZHI  
 CHEN HAI YAN

## - Stations d'essai des provinces suivantes :

Heilongjiang	TIAN HUA	(Assistant Ingénieur)
Hunan	WANG TSEN KUEN	(Technicien)
Shilin	SHU TSEN HUAN	(Ingénieur)
Shanxi	KEN HAO	(Ingénieur)
Fujian	FAN TANG	(Ingénieur)
Gansu	TSEU TU	(Technicien)
Guangdong	.....	
Guangxi	WANG SIAO LING	
Xinjiang	HUANG TSU CHUAN	
Zhejiang	TSAO SHIA KUN	
Région autonome de Ningxia	KING ME TRAO	
Sichuan	LUO TIN KE	(Ingénieur)

ANNEXE VCompte-rendu journalier d'activités du consultant pendant la mission

- 23 septembre 1983 : arrivée à l'aéroport de Pékin en fin d'après-midi.
- 24 septembre : contact avec l'UNDP, démarches administratives diverses. Visite de l'Académie de Machinisme Agricole de Pékin.
- 26 septembre : visite de la station d'essai de machines agricoles de Pékin. Début de vérification du matériel de mesure. Réunion de mise au point avant l'essai du cultivateur rotatif.
- 27 septembre : vérification du matériel SEDEME (capteurs + TS 106), démonstration de fonctionnement des pénétromètres. Etude de l'équipement du tracteur pour l'essai du cultivateur rotatif.
- 28 septembre : équipement du tracteur pour l'essai du cultivateur rotatif. Essai de la télémessure à poste fixe dans la cour de la station.
- 29 septembre : essai dans les champs du cultivateur rotatif monté derrière le tracteur Tie-Niu 65. Enregistrement au moyen de la télémessure et mesures diverses sur le terrain.
- 30 septembre : début de la lecture des résultats enregistrés de l'essai aux champs
- 4 octobre : équipement et essais du chronomètre KIENZLE.
- 5 octobre : suite du dépouillement des résultats de l'essai aux champs. Vérification du fonctionnement des barres dynamométriques avec le TS 106.
- 6 octobre : séminaire sur les essais de matériel de travail du sol : aspects quantitatifs et qualitatifs.
- 7 octobre : suite du dépouillement des résultats de l'essai aux champs. Réunion de mise au point pour la préparation des dispositifs d'étalonnage du couplemètre et des barres dynamométriques.
- 8 octobre : visite de la ferme d'Etat de Suan Tchiao près de Pékin.
- 10 octobre : séminaire sur les liaisons tracteur-outils, présentation des mesures complexes réalisées lors du stage en France au CEMAGREF de MM. WANG, XIE et LI.
- 11 octobre : démonstration du matériel relatif aux mesures sur les sols et du matériel de mesure pour les assistants aux séminaires.
- 12 octobre : démonstration détaillée de l'utilisation des matériels TS 106 et KIENZLE pour le personnel spécialisé de la station.
- 13 octobre : séminaire sur les essais de Moissonneuses batteuses.

14 octobre : démonstration détaillée de l'utilisation du couplemètre, du compteur de fuel et des barres d'attelages dynamométriques pour le personnel spécialisé de la station.

17 octobre : séminaire sur les essais d'endurance de matériels agricoles.

18 octobre : étalonnage du couplemètre REILHOFFER au banc d'essai. Démonstration de mesure d'efforts inclinés au moyen des barres d'attelages dynamométriques (mortage d'essai réalisé à la station).

19 octobre : compléments de précision sur le fonctionnement du matériel de mesure. Suite du dépouillement de l'essai aux champs.

20 octobre : suite du dépouillement de l'essai aux champs, analyse de quelques problèmes relatifs au programme de dépouillement. Réunion avec les participants à séminaires.

21 octobre : réunion de travail avec les responsables de la station. Suite de l'étude du programme de dépouillement des résultats des essais aux champs.

Le consultant,  
J.F. BILLOT :

L'Ingénieur en chef de la  
station d'essai :

14162  
(4 of 4)

CEMAGREF

Project for the China Agricultural Machinery Testing Centre

\_\_\_\_\_

United Nations Development Programme: Project DP/CPR/80/017

\_\_\_\_\_

Contract concluded with CEMAGREF for the project implementation  
(United Nations Organization for Industrial Development :Contract T81/23)

\_\_\_\_\_



Mr. BOUHAGEB Amor's mission to China  
September 2 to September 30, 1983

1983

\_\_\_\_\_

Report by the consultant specialized in  
tractor and walking tractor tests

\_\_\_\_\_

C E M A G R E F

Project for the China Agricultural Machinery Testing Centre

---

United Nations Development Programme: Project DP/CPR/80/017

---

Contract concluded with CEMAGREF for the project implementation  
(United Nations Organization for Industrial Development :Contract T81/23)

---

Mr. BOUHAGEB Amor's mission to China  
September 2 to September 30, 1983

---

Report by the consultant specialized in  
tractor and walking tractor tests

---

## CONTENTS

---

### Introduction and summary

- I - Power and fuel consumption measurement of tractors and engines :  
starting-up of eddy current dynamometric brakes ; tests carried  
out and checking of additional equipment and installations.
  - I.1. Description of the brake equipment
  - I.2. Remarks on the setting-up and implementation of the three  
brakes
  - I.3. Remarks on the brake water-cooling system
  - I.4. Reception of dynamometric brakes with carrying-out of  
complete tests
  - I.5. Other tests carried out on the dynamometric brakes
  
- II - Operation of measuring instruments and equipment for  
miscellaneous checkings of tractors at work
  - II.1. Noise measurement
  - II.2. Analysis and measurement of exhaust gas opacity
  - II.3. Measurement of the force exerted on the brake pedal
  - II.4. Measurement of drawbar pull during tractor tests on a  
tarmacadam track
  
- III - Other testing benches being built in the Centre
  - III.1. Construction of the testing bench for walking tractors  
and motor hoes
  - III.2. Construction of the testing bench for tractor's hydraulic  
lift systems
  - III.3. Construction of a pendulum equipment for measuring tractor's  
inertia moment
  - III.4. Construction of a dynamic testing bench for tractor  
safety structures
  
- IV - Seminars held during the mission

- Appendix I - Minute of the acceptance of the three brakes drawn up in Beijing on September, 25 th, 1983
- Appendix I bis - Copy of the documents concerning the reception of the three brakes in the factory, confirmation provided on July, 27 th, 1982 by the manufacturer
- Appendix II - Curves of the Shanghai 50 tractor p.t.o. test on the W 700 brake and detailed results. Test report (worked out by the Centre)
- Appendix III - Curves of the TIENU 65 tractor p.t.o. test on the W 400 brake
- Appendix IV - Curves of the W 70 Schenck brake absorption and power of the 495 A engine of the SHANGHAI 50 tractor.
- Appendix V - Curves of the 495 A engine test of the SHANGHAI 50 tractor on the W 400 brake and detailed results. Test report (drawn up by the Centre)
- Appendix VI - Curves of the p.t.o. test of the TIENU 80 tractor on the W 700 brake and detailed results
- Appendix VII - List of engineers and technicians who took part in the mission of the consultant
- Appendix VIII - Daily report of the mission
- Appendix IX - List of the documents handed over to the Centre.

## INTRODUCTION AND SUMMARY

The CEMAGREF has bought and dispatched to China the equipment required for the China Agricultural Machinery Testing Centre in Beijing, in conformity with the United Nations DP/CPR/80/C17 project. China provided with such equipment will be able to carry out tractor bench tests according to procedures approved at the international level and well-known to the three technicians who attended a training course related to the matter at Antony from August, 1982 to January, 1983.

My mission was mainly concerned with tractor and engine bench tests (performance tests) and took place after the equipment delivery to the Beijing Centre and a mission during the same month - of Mr Janin assisted by Mrs Kleman, to prepare the starting up of tests with the supplied equipment.

During my mission I also held five seminars dealing with the test procedures (including tests of tractor safety cabs) and made some recommendations to complete the setting up of equipment and testing benches that were being built (walking tractors and tractor hydraulic lift systems).



I Power and fuel consumption measurement on tractors and engines :  
starting-up of eddy current dynamometric brakes ; tests carried out  
and checking of additional equipment and installations.

### I.1 Description of the brake equipment

Three brakes were selected within the framework of the UNIDO contract for the equipment of the Agricultural Machinery Evaluation Centre in Beijing. The power whether directly at the engine or at the tractor power-take-off can be determined through such brakes and the power, torque and consumption curves according to the speed - can be drawn -.

The brakes are eddy current dynamometric devices including a measurement of the force by strain gauges transducers as well as a torque digital display (supplier = Schenck Company). These brakes are equipped with an electronic regulation box allowing to test torque or rotational speed regulated engines.

An all - purpose meter combined with a rotation speed sensor indicates the engine or power-take-off speed. The meter coupled with a consumption measuring device allows to calculate the hourly and specific consumptions. The three brakes are fitted with a volumetric measuring device of fuel consumption (supplier = Schenck Company). Moreover a weighing method was foreseen for the most powerful brake designed for the power measurement at the tractor power-take-off (supplier = S 3 EP Company).

The transfer of the torque measurement on a dial located near each brake makes easier the adjustments of the injection pump without requiring to go in the measuring room for the torque reading. This device is very useful during the preliminary engine or tractor test before the measurements of the official test.

Engines are fitted with a remote control which enables to vary the engine or power-take-off speed from the measuring hall.

Thermocouples are used to check the engine running temperatures, particularly the oil, water, fuel and air temperatures, the reading being made through digital display on compensation gates (supplier = Difetec Company).

(See the list of supplied equipment enclosed as an appendix in Mr. Janin's report).

## I.2 Remarks on the setting-up and implementation of the three brakes.

Upon my arrival, I drew up a report on the situation and the progress of the works in cooperation with the heads of the Centre by using the list prepared by Mrs Kleman during her mission in July 1983. All the work which was still to be done and reported during her mission was in fact carried as directed.

I have resumed below the main remarks I made concerning the installation and operation of the three brakes.

a) the access to the brakes must be revised as far as the door frame and lock are concerned : in case of fire the operator is likely to be held up in the brake hall, the door being opened from the measuring hall.

b) there is a lack of fire extinguishers near the brakes and engines.

c) the setting up of remote controls for tractor and engine governors must be revised. Large bends with low radius in the cables should be avoided.

d) see to the perfect alignment of engines and tractors at the drive level within acceptable limits :  $\pm 1$  degree of false alignment for engines and  $\pm 3$  degrees for tractors. Check the tightening of coupling flanges. Adjust the extension of the drive.

e) the control racks for the brakes must be fastened to the concrete bases.

f) see to the cleaning of cement dust which will fall on the testing equipment during the first months following the end of building.

g) lubricate brakes bearings and the drives according to the manufacturer specifications.

h) it would be advisable to adjust the heights of consumption volumetric measuring systems according to the heights of tractor tanks to avoid draining the supplying pumps.

i) the exhaust gas hoses which are quite heavy must be stored on supports laid on the ground and not on the admission pipes of the tractors.

j) attach the electric control box of the systems designed for the level adjustment of the brakes.

k) furnish the engine and tractor hall with electric light.

### I.3 Remarks on the water cooling system for the brakes.

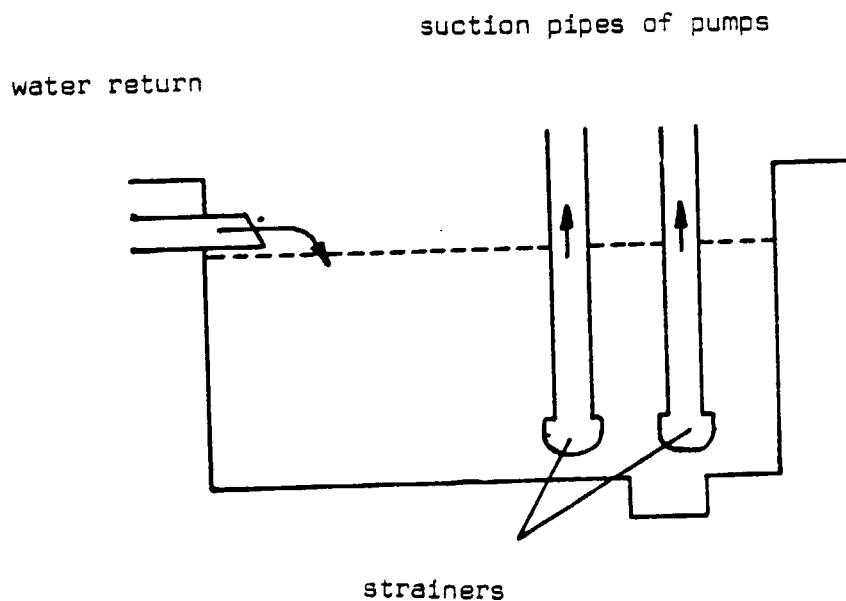
This system is described in the plans of the station and in Mrs Kleman's report on her mission

The water storage tank was built with some defects :

a) the suction level of the pump strainers is too low and is likely to entail a suction of the sludges settling at the bottom of the tank.

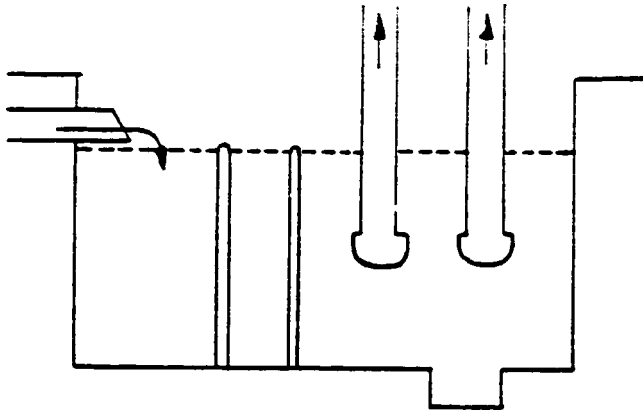
b) the water return system is not separated from the water storage tank and is the origin of swirls that will produce suspension of settled sludges at the bottom of the tank.

c) there is no water filtration system.



present situation

Solution proposed



- raise and position the suction strainers half way up the water level.
- arrange two partitions in the water tank in order to set up two settling tanks

Modifications were made to the apparatus after the meetings held on this problem with Mr. ZENG RONGDE, the architect of the Centre buildings and Messrs. TU, LI, XIE and WANG. These meetings were attended with great interest and comprehension ; the arrangement of the partitions in the water storage tank was postponed because of shortage of time.

It was decided to take the hardness of the municipal water into account and to use softened water from the water heating station of the Centre.

#### 1.4. Reception of dynamometric brakes with carrying-out complete tests.

The installation and operation of the control racks and the brakes were both checked with the help of a representative of the Schenck Company (Mr. Maibaum) who stayed three weeks at the Centre. His mission was scheduled within the framework of the contract concluded between CEMAGREF and Schenck Company in order to arrange and check the devices of several makes by carrying out, when possible, complete tests at the moment of brake reception. One will find in Appendix I the copy of the protocol of reception of the three brakes which was drawn up at the end of the whole tests and before the departure of Mr. Maibaum. This protocol should be related to the documents drawn up after the reception of the brakes at the factory (see Appendix I bis).

##### a) Checking at the mechanical level :

- . position of the brakes
- . horizontality
- . transmissions assembly
- . checking of the alignment with the equipment and during the tests
- . checking of the clearance of the rotor and the bearings.

##### b) Checking of electric connections between the control racks and the brake.

- . checking of the power supply.
- . checking of the connections between the different functional steps set up in the control racks.
- . setting-up of the temperature checking racks. These racks were not supplied by Schenck, because they were ordered to the Difetec Company, and were placed within the brake control racks ; they allow one to check the engine and tractor operating temperatures during tests (oil, water, air, fuel).

##### c) Calibration of the W 700, W 400 and W 70 brakes and adjustment of the regulation slopes.

- . calibration in torque with marked weights.
- . calibration in rotation speed with a pulse generator.

The regulation slope adjustment was obtained by using the characteristic curves of diesel engines.

d) carrying-out of the fuel consumption weighing measurement with the fuel weighing unit supplied by the S3EP Company. The fuel consumption weighing method was successfully operated during the complete test of the W 700 brake.

e) carrying-out of the temperature measurement (equipment supplied by the Difetec Company) the above-mentioned installation in control racks of the Schenck Company did not raised any problem.

f) reception of the W700 brake with the p.t.o. test of the SHANGAI 50 tractor.

The test was carried out on September 14 th 1983 in presence of the tractor manufacturer, Mr. Wang and two technicians of the Division. The testing method used was drawn from the OECD Standard Code for the official testing of agricultural tractors, c(80) 60 Final Appendix I (running-in characteristics of agricultural tractors) : paragraph B 1.

The test report was worked out by the technicians of the Centre and a copy is enclosed (see Appendix II).

At this time of the year ambient temperature conditions made necessary the start of official test at 7 a. m. to avoid temperatures higher than 27°C. This temperature is the upper limit for an official test. The test was carried out at full load (the governor control being set for maximum power).

At the end of the test we used the automatic plotting program of tests curves on the micro-computer HP 98-45 which was part of the equipment supplied to the Centre (see Mr. Mechineau's report).

One can see that the 2000 rev./min. rated engine speed specified by the manufacturer is very close to the engine speed which allows to obtain the standard power-take-off speed at 1000 rev./min.

g) Reception of the W 400 brake with the p. t. o. test of the TIENU 55 tractor.

It had been decided to test an engine on this brake which was selected to test engines as well as tractors at the power-take-off.

After the setting-up of the Beijing 4115 engine and some preliminary measurements it was decided to renounce the engine test and to replace it by a TIENU 55 tractor p. t. o. test.

This tractor was selected in the tractor park of the Centre to carry out the field test of a power driven rotary tool.

Therefore, the OECD type curves of power and consumption at maximal load were useful for comparing the results with those of the field test for which this tractor would be equipped with a fuel consumption measuring device and also with a torque meter, allowing to calculate the power required by the tool and the specific consumption after remote transmission and data processing on micro-computer.

Three divisions took part in this test : the division I : "Bench testing of tractors and engines", the division II : "Evaluation" and the division III : "Instrumentation".

The copy of the test report compiled by the technicians of the Centre will be found in Appendix III.

h) Reception of the brake W 70 by using the 495 A engine of the Shanghai 50 tractor.

The engine choosen by the Centre for receiving this low powered brake could not be tested at its full power.

In fact, the selected engine was the 495 A engine of the Shanghai 50 tractor with a 36.6 kW power at 2000 rpm while the absorption curve of the W 70 brake allows only to brake 30 kW at 2000 rpm ( see Appendix IV).

Therefore, we were compelled to change the adjustment of the engine to reduce its power and to be able to test the W 70 brake at a power that was likely to be absorbed.

The operating specifications of the brake could be checked all along the test.

After the test of the brake we installed the 495 A engine of the Shanghai tractor on the W 400 brake which had a satisfactory absorption curve, this choice allowed us to test this engine at maximal load according to the OECG procedure (see Appendix 1, paragraph B1).

The curves of the corresponding test report compiled by the technicians of the Centre will be found enclosed see Appendix V

### I.5. Other tests carried out on the dynamometric brakes

Besides the test of the 495 A engine on the W 400 brake the following tests were carried out :

a) the complete p.t.o test of Tienu 80 tractor on the W 700 brake.

The manufacturer of this new tractor was interested in testing the prototype. Such test was carried out on the W 700 brake. See curves and test results in Appendix VI.

Once more, the rated engine speed - not specified by the manufacturer - is identical to the engine speed corresponding to the standard p.t.o speed.

b) tests of W 700 and W 400 brakes simultaneously used (checking of the operating characteristics of the brake cooling system).

To carry out this test, the biggest tractor of the Beijing Centre (a 4 WD 1300 Fiat tractor of a 96 kW p.t.o maximum power at rated engine speed) was put on the W 700 brake and a 50 Shanghai tractor (36.5 kW) on the W 400 brake.

The test was aiming at checking the operating of the water cooling system for long duration test when high power is to be absorbed by the brakes under maximum climatic conditions.

The results obtained were as follows :

Average outside temperature : 27°C

Test duration : 7 hours

Power absorbed by the brakes : 132.6 kW

Indoor temperature : 32°C

Maximum temperature of the water flowing into the brakes : 36°C

Maximum temperature of the water flowing out of the brakes : 39°C

These results show that the water cooling system of the brakes works satisfactorily under an outside temperature which is not an extreme one from a climatic viewpoint (27°C is not the maximum temperature recorded at the Centre) but which leads to an indoor temperature exceeding the limits stated by the OECG testing code (tests to be carried out between 15°C and 27°C).



## II Operation of measuring instruments and equipment for miscellaneous checkings of tractors at work

### II.1. Noise measurement

The starting-up of the sound level meter supplied by the Bruel and Kjaer Company was postponed as a component in the power card was damaged.

The Beijing representative of the Bruel and Kjaer company took care of the failure and replaced the component of the power card ; so the sound level meter was put into operation with the staff of Divisions I and II of the Centre

### II.2. Analysis and measurement of exhaust gas opacity

The equipment supplied by the Bosch Company was put into operation and a demonstration of the equipment was conducted with the staff of Divisions I and II.

### II.3. Measurement of the force exerted on the brake pedal

The freinograph supplied by the NAUDER company was delivered with two pressure sensors to measure the force on the brake pedal ; an oil leakage was detected on these pressure sensors during the tests. The pressure sensors have been sent back to the manufacturer and have been forwarded to Beijing in March 1984.

### II.4. Measurement of drawbar pull during tractor tests on a tarmacadam track

As the testing track was being laid out during the mission the measurements of drawbar pull could not be carried out, as such measurements cannot be done on public roads without danger. Works started upon my arrival in China. The track was plotted along a North-South axis on the East of the Centre buildings (see general plan enclosed with Mr. Janin report).

The testing track was a rectilinear one, 130 m long and 4 m wide which would be changed into a loop-shaped one in the future. This future project seems to be related to an extension of the Centre.

The track is made of a gravel mixture 30 cm deep and mechanically stabilized, of reinforced concrete about 12 cm deep and of a concrete top layer of low granulometry.

On the side of the track there is a ditch (0,30 x 0,30 ) for rainfall run-off .

The surface aspect of the track seems sufficiently rough but the first tests to be carried out on the tarmacadam will give a better idea of the track adhesion coefficient.

At the end of my stay, the track was finished and the civil engineering works of the surroundings of the track were under way (see photos enclosed with Mr Janin 's report).

### III. Other testing benches being built in the Centre

#### III.1. Construction of the testing bench for walking tractors and motor hoes

The construction of the bench will allow one to determine the power actually available on a walking tractor or a motor hoe either at the wheel axle or implement level. The power thus determined is lower than the engine power which does not take losses in the gear-box into account. These losses vary according to the type of drive : belt, chain, auger, bevel gear... etc... Those different types of gears can be grouped together on the same walking tractor. (For instance : belt and auger, chain and auger, chain and belt). As the efficiency of such gears is very different, the power at the wheel axle cannot be drawn from engine power alone .

The bench which has to be built at the Beijing Centre is similar to the bench carried out as a prototype by CEMAGREF at Antony and will be used in the future for the testing of walking tractors and motor hoes if a test standard has been developed in accordance with the manufacturers.

As far as the walking tractor is concerned the measurement principle is based on coupling two hydraulic pumps to the wheel axles (wheels being removed).

The pump casing is connected to a fixed point through a strain gauge force sensor which allows to calculate the torque developed on the rotating shaft. At the hydraulic pump outlet, a head loss is produced by a servovalve electrically activated and hydraulically controlled by the head pressure of the pump. This head loss is related to the load moment which slows down the rotating shaft. The head loss will be set to cover the whole curve of the available power. The choice of the distance between the axle of rotation and the strain gauge force sensor (3 available positions) allows to calculate the torque from the measured effort. The power absorbed by the shaft is calculated through the use of a rotating speed pulse counter. As the bench was not yet built during my stay in Beijing we surveyed with Mr. Li ( in charge of the test bench) all the different components in order to explain the function of each one and to accurately identify of various hydraulic tappings.

The measurement system was assembled in order to check its good working order. A seminar has been organized on walking tractors testing which gave supplementary information.

#### III.2. Construction of the testing bench for tractor hydraulic lift systems

This bench is intended to measure the operating characteristics of the hydraulic pump and lift of agricultural tractors.

The bench consists of a jack connected to a fixed point, a return pulley and a sling for fastening the holed drawbar for the tractor lift. A hydraulic pump, manually operated, sets the ram of the hydraulic jack and applies tension to the system ; then the hydraulic accumulator is put into operation through a shutoff valve.

Such accumulation goes against the lifting force and can be set through the shutoff valve.

A strain gauge force sensor allows one to measure the lifting force and is placed between the sling and the tractor holed drawbar. A straight line potentiometer measures the lift movement and is connected to a fixed point, the rod moving together with the holed drawbar of the tractor lift.

During my stay, the pit for the setting up of the ram crutch was completed, but the mechanical elements were under construction outside the Centre.

Therefore, the different elements of the testing bench were checked over with Mr Li. The measurement system of the lifting force and movement was put into operation to check its good running order.

Additional information was given during the seminar dealing with OECD tractor tests.

The Beijing Centre will add equipment to this bench in order to make measurements of flowrate and pressure on the external tappings of the hydraulic lift so as to carry out the pump hydraulic power test.

The undermentioned copy includes the supplying of measuring equipment of flow rates and pressures asked for by the CEMAGREF for the project but which could not be accepted within the financial limits set for the purchase of equipment in the CEMAGREF-UNIDO contract.



TECHNIQUES EUROPEENNES MODERNES D'EQUIPEMENT

Société CEMAGREF  
Parc de Tourvoie  
92160 ANTONY

Votre réf.

Notre réf. OH/DP N° 6092 A

Paris, le 25 Février 1983

L'Attention de Mr. BOUHAGEB}}

Messieurs,

Suite à l'entretien téléphonique de ce jour, nous vous confirmons notre meilleure offre pour :

- COFFRET DE MESURE K 23 QDSV/TD/Pv40-P400/220V.

comportant :

QDSV = 1 canal de débit à affichage digital et sortie  
enregistrement tension ( 2V. pour Ri= 50 Kohms)

TD = Canal de mesure de température à affichage digital  
y compris capteur

Pv40-P400 = 2 manomètres de pression branchés en parallèles  
dont :

- . 1 manomètre 0-40 bar protégé
- . 1 manomètre 0-400 bar

220 V. = Alimentation secteur

P.U. Frs : 26.790.-

- TUBE DE MESURE HYDRO RE 1 25/120

Plage de débit = 12 à 120 l/mn

Pression de service = 400 bar

Température = 12° C.

étalonné à 30 cSt

équipé de 2 manchettes et 1 robinet pointeau

P.U. Frs : 6.212.-

Plus value pour emballage maritime Frs : 760.-

.../.....

.....

DELAI : env. 6 semaines

OPTION DU DEVIS = 2 mois

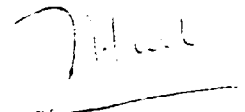
PRIX : Ils s'entendent hors taxes pour matériel départ Paris  
Ils sont révisables en fonction des variations de  
parité des monnaies européennes pouvant intervenir  
jusqu'à la livraison.  
Prix calculés sur la base de 1 DM = 2,81 FF.

REGLEMENT : 30% à la commande par chèque  
le solde à la livraison.

Restant à votre entière disposition,

Nous vous prions d'agréer, Messieurs, nos salutations distinguées;

T E M E Q U I P  
A. GENTIL



### III.3 Construction of a pendulum equipment for measuring the inertia moment of tractors.

This testing bench is intended to determine the inertia moment of agricultural tractors and other farm equipment ; walking tractors, trailers ... The location of the centre of gravity of the equipment undergoing testing can also be determined by this method.

During my visit, the civil engineering works for setting up the bench were in progress.

The plans for operating the bench were discussed with the technician in charge of the project : Mr. TANG ZHENQUIU. The technical presentation and the explanations given should guarantee correct completion of this testing bench.

### III.4 Construction of a dynamic testing bench for tractor safety structures.

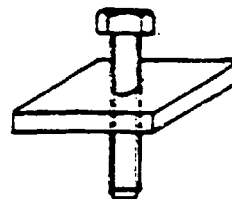
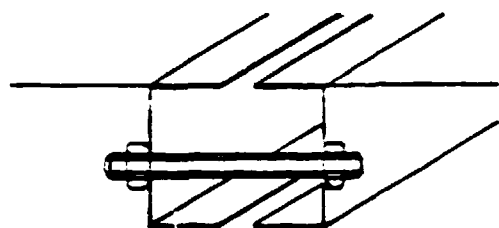
This bench is aiming at testing the safety frames and cabs mounted on the tractor to protect the driver from the risks of overturning.

The test is based on the following principle : the tractor with its safety structure submitted to the test is fixed to the ground with anchoring devices. A 2,000 kg pendulum mass supported by chains is released to hit the structure with a depth of fall calculated according to the tractor weight and wheel base. On the same structure, the first blow should be at the rear, the second at the front and the third at the side. A crushing test both at the front and rear of the structure is carried out on a crushing bench. At the end of the test, the cab shall be carefully examined for cracks and tears.

As I was in the Centre the bench was under construction ; the civil engineering works were completed including the rails for holding down the tractors.

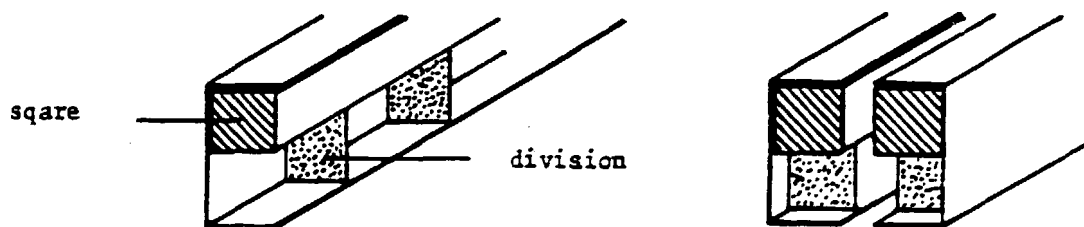
I informed the heads of the Centre that the peculiar design of the rails would be liable to impede the users from putting a tractor into the right position.

a) at CEMAGREF, the "U" shaped irons are first fitted together according to the following diagram, and then drowned in concrete.



fastening  
plate

b) at the Beijing Centre, the "U" shaped irons were not fitted together but firstly reinforced beforehand with a square welded in the edge of the "U" and then divided with flat iron as follows :



The fastening plates of the tractor anchoring points will not slide in the "U" shaped irons thus fitted.

Another point mentioned during my visit : the fastening system of the pendulum supporting chains to the concrete beams of the roof should be reinforced to take into account the vibrations generated by the impact of the 2,000 kg mass and the bounce after the blow. Following these remarks, a meeting was held with the architect of the Centre, Mr. ZENG RONQGE and Messrs. TU, LI, XIE and WANG.

It has been decided to take these remarks into consideration and to study at the design stage the changes to be made to the installation.



#### IV Seminars held during the mission

Five technical seminars were conducted by the consultant with an audience of about forty delegates of different regions of China.- See the list of agricultural machinery testing stations that sent delegates to the technical seminars annexed to Mr JANIN's report.

These seminars provided the opportunity to exchange ideas and to answer questions on the different aspects of the tests scheduled within the scope of the OECD, the International Standard Organization (ISO) and national regulations.

The audience took an active part in the closing debates of each seminar.

The consultant made use of abundant visual aids (about 400 slides).

A French - Chinese interpreter worked during the seminars and the conversations that were held all along the mission.

The seminars dealt with :

1. OECD testing of agricultural tractor performances : p.t.o. tests, engine tests, track tests, ambient noise measurement and noise measurement at the driver's ear.

2. OECD dynamic and static tests of safety structures mounted on agricultural tractors.

3. Power lift and hydraulic pump tests.

4. Walking tractor tests.

5. The technology of dynamometric eddy current brakes, Schenck type.

A seminar on the measuring instruments and electronic equipment of Schenck type brakes was led by Mr. Maibaum from Schenck Company.

The seminars were attended with great interest. The audience proved its interest by the many questions and the complementary information asked for during the days following the seminars.

## CONCLUSION

The mission made it possible both to start up the p.t.o. tractor and engine test equipment, and at the same time to carry out a number of thorough tests in accordance with the OECD procedure, which is very similar to its ISO counterpart (ISO.789/1 heading 6.1.).

P.t.o. tests in compliance with generally accepted procedures should enable the Chinese agricultural authorities and farmers to assess the performances of tractors supplied by domestic production ; in particular fuel consumption and power.

These tests should also benefit manufacturers by providing them with concrete data which can be used as a basis for further technical improvements.

The mission was carried out in excellent conditions. It also gave me the opportunity to organize 5 seminars and state recommendations regarding testing benches still under construction. The staff of the Centre turned out to be a serious and demanding working partner from the point of view of both information and training. In addition, there is no doubt that this highly qualified staff will have no problem in operating the tractor and walking tractor test equipment included in the project.

At the end of the mission , the Centre was given a daily account of my stay (see appendix VIII) and documents regarding test procedures (see appendix IX).

Appendix XII lists the names of the engineers and technicians of the Centre who took part in the mission. To them as well as to Mr. TUBINGHENG and my interpreter, Mr. CHAN, I wish to express my thanks for their courtesy and invaluable help.

Annexe I : Procès verbal de réception des 3 freins rédigé à Pékin  
le 26 septembre 1983

Beijing, le 26/09/83

Protocol about acceptance of the eddy current dynanometers  
LWF 0172, LWI0600, LWK0106 and LEB1010 in the Agricultural  
Machinery Testing Station in Beijing.

1. One display (Typ 385/01) of the torque measuring has a fault and will be taken back to Schenck Company by Th. Maibaum. One new display will be send back to Testing Center by Schenck and Cemagref.
2. At the dynanometer W 70 appeared noises, which are caused by the loose bearing. The temperature during our test was not higher than 35 degrees Celsius.

measured values : axial - 3/100 mm  
radial - 5/100 mm (loose bearing)  
radial - 3/100 mm (fixed bearing)

3. The maximum speed af all 3 dynanometers was decreased in accord with the customer and Cemagref.

max. speed : W70 - 5000 t/min  
W 400 - 3500 t/min  
W 700 - 1500 t/min

4. The spare parts were checked by Cemagref.
5. The 3 dynanometers and the whole equipment are working satisfactorily.

Schenck AG

Agricultural Machinery  
Testing Station Beijing

Cemagref

Signé : MAIBAUM

Signé : TU BINGHENG

Signé : BOUHAGEB

Annexe I bis Copie des documents de réception des 3 freins  
en usine, confirmés le 27 juillet 1982 par le constuc-  
teur.

PRÜFPROTOKOLL FÜR WIRBELSTROMBREMSEN

Fert.Nr. : 1 LWK 0106 .. Serien Nr.: 5 LZV 1376 ..  
 Größe : W 700 .. Bremsen Nr. : 3 ..  
 A.Z. : L 607.190A .. Waage WDK Nr. : ..  
 Kunde : .. Kraftmeßdose : U2-1K / Nr.: 75374 ..  
 SSA / CEMAGREFF (CHINA) .. Luftdose Typ : .. Nr.: ..  
 Besondere Ausrüstung: .. Meßbereich : max 4.000 N/Nm/ks ..  
 .. Tachometer : 0-3000 1/min ..  
 .. ..  
 .. ..

Axialspiel Festlager : 0,2 .. mm Luftspalt : 4,04 .. mm

Planschlag am Flansch Radialschlag am Zapfen

	M3D	vor PrL	nach PrL		M3D	vor PrL	nach PrL
Festlager			0,015				0,01
Loslager							0,01

2.10 min 2.20 2.30 2.40 2.51 2.52

2.60

Meßpunkt	1/min	N/Nm/ks	KV/25	T <sub>A</sub> °C	T min	Be-trieb	Lagertemperatur Festl. / Loslager
I	4800	30	15,1		30	M	36°C / 32°C
II	130	2140	29,1			M	
III	220	2820	65,0			M	
IV	930	1580	153,9	72	1	M	
V	2310	625	151,2		10	M	
VI							

Restanzeige L..... R.....

Kennlinie a - b			
a	1470	1000	153,9
b	1210	146	18,5

Anlage geprüft durch : HERTEL .. Datum : 15.7.1982 ..  
 Gesehen : 16.7.1982 MEHNER ..

Prüffeld für Leistungsbremsen  
 Darmstadt, den 27. 07. 82 Gerbig



Meß- punkt	1/min	<del>n</del> / <del>mm</del> / <del>sp</del>	<del>n</del> / <del>mm</del> / <del>sp</del>	26		Be- trieb	WASSER- Lagertemperatur	
				t oC	T min		Festl.- SEITE	Loslager- SEITE
WARM-								
LAUF	930	1560	151,9			M	57°C	60°C
	930	1500	151,9		50	M	58°C	61°C
	3000	13	4,1					
	4000	23	9,6					

Bemerkungen/Beanstandungen

Für diese Zeichnung behalten wir uns alle Rechte gemäß DIN 34 Abschnitt 2.1 vor

 **CARLSCHENCK**

- schenckfabrik GmbH D-61 Darmstadt -

4 PRL 178

Rückseite

No	2.12.74
Name	W. Burkhard
Datum	1.12.74

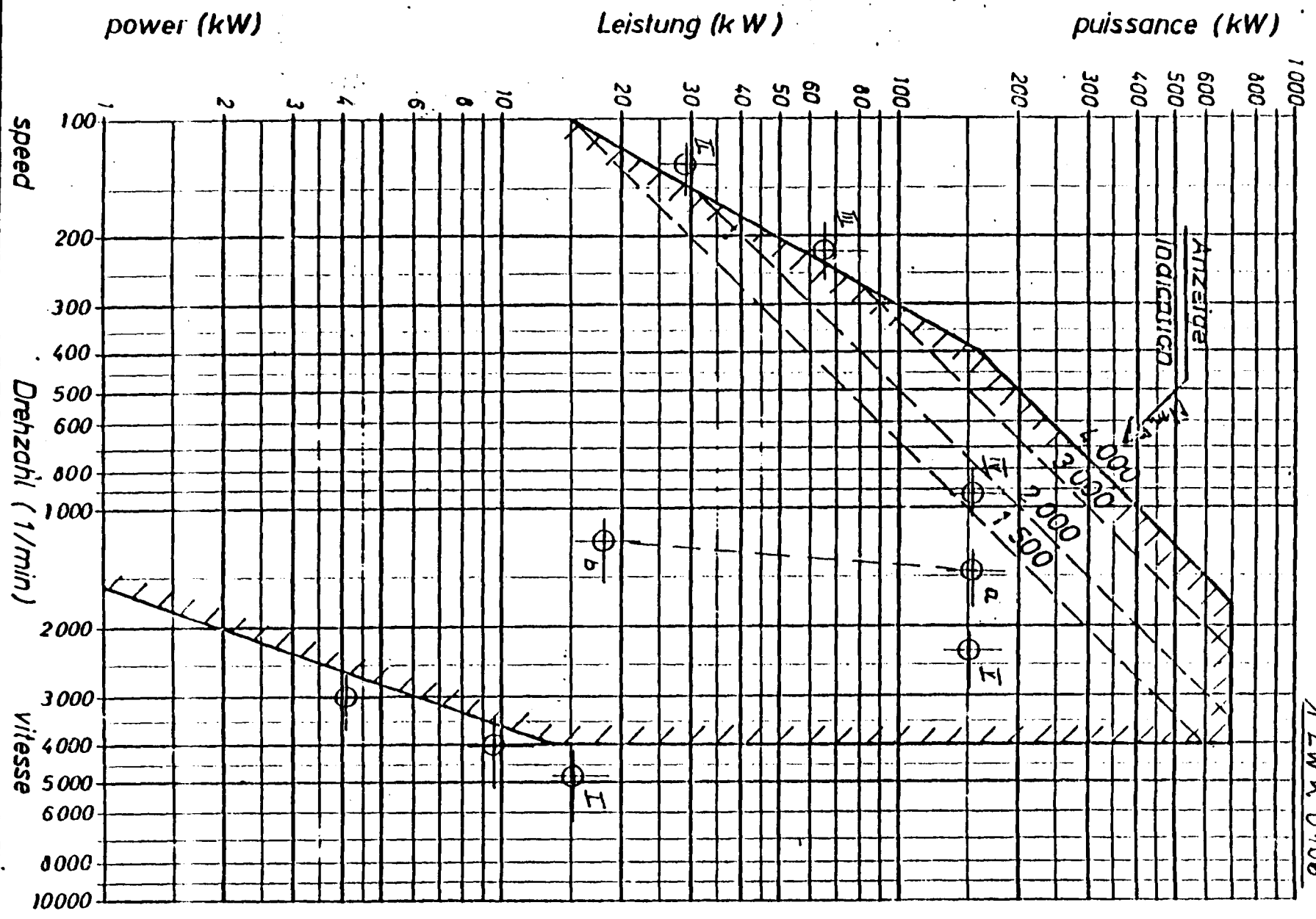
Man. Nr. 1777

Alle Rechte vorbehalten. Vervielfältigung und Verbreitung, auch auszugsweise, ist ohne schriftliche Genehmigung der Carl Schenck AG. Nachdruck ist strafbar.



CARL SCHENCK AG  
D-61 Darmstadt

D 6020



Wirbelstrombremse<sup>27</sup>  
W 700

LP7 060

1 LMK 0106

# Prüfungs-Protokoll für Bremsen mit elekt. Kraftmeßeinrichtung

Auftrags Nr. 1 LWK 0106 Typ W 700 LZV Nr. 1376-3  
 Höchstlast 4000 Nm Anzeige digital ~~3 1/2~~ ~~3 3/4~~ 4 1/2  
 analog ~~500~~ 144 x 144  
 Prüfhebel Länge 1530,0 mm Kraftaufnehmer Typ U 2-1 E  
 Fabr. Nr. 75374 Anzeigen Teilung 1 Nm / 10 Nm  
 Drehrichtg. 2 Meßber. 1 Belastung 1 : 15

## Belastung des Kraftaufnehmers

Druck						Zug					
Last aufwärts Nm	Fehler		Last abwärts Nm	Fehler		Last aufwärts Nm	Fehler		Last abwärts Nm	Fehler	
	digital	analog		digital	analog		digital	analog		digital	analog
0	0	0	0	0	0	0	0	0	0	0	0
900	0	0	900	+1	+10	900	0	0	900	+1	+10
1800	-1	+10	1800	+3	+20	1800	0	0	1800	+2	+10
2700	+1	+20	2700	+2	+20	2700	0	0	2700	+2	+20
3600	0	0	3600	+1	+20	3600	-1	+10	3600	+2	+20
4000	0	0	↑			4000	-1	+10	↑		

Bemerkungen \_\_\_\_\_

Prüfer NICKEL Apt. M3D Datum 7.7.1982 Name NICKEL

12.10.80 LL

Für diese Unterlage behalten  
wir uns alle Rechte gemäß  
DIN 34 Abschnitt 2.1 vor.

**CARL SCHENCK AG**  
D-6100 Darmstadt



**PRÜFPROTOKOLL FÜR WIRBELSTROMBREMSEN**

Fert.Nr. : 1 LNI 0600 Serien Nr.: 5 LZV 1575  
 Größe : W 400 Bremsen Nr. : 6  
 A,Z. : L 607.190A Waage WDK Nr. : /  
 Kunde : SSA / CEMAGREFF (CHINA) Kraftmeßdose : U2-12 / Nr. 43024  
 Besondere Ausrüstung: / Luftdose Typ : / Nr. : /  
 Meßbereich : max 2000 N/A  
 Tachometer : 0-5500 1/min

Axialspiel Festlager : 0,16 mm Luftspalt : 3,00 mm

**Flanschlag am Flansch**

**Radialschlag am Zapfen**

	M3D	vor PrL	nach PrL		M3D	vor PrL	nach PrL
Festlager			0,02				0,01
Loslager							0,005

2.10 min 2.20 min 2.30 min 2.40 min 2.51 min 2.52 min

**2.60**

Meßpunkt	1/min	N/Nm/Kz	KW/25	t <sub>A</sub> °C	T min	Be-trieb	Lagertemperatur	
							Festl.	Loslager
I	6600	20,1	13,9		30	M	38°C	39°C
II	100	878,5	9,2			M		
III	170	1179,6	21,0			M		
IV	2570	525,4	141,4	74	1	M		
V	4770	286,5	143,1		10	M		
VI								

Restanzeige L..... R.....

**Kennlinie a - b**

a	1900	716,2	142,5
b	1710	70,9	12,7

Anlage geprüft durch : MISCHLICH Datum : 12.3.1981

Gesehen : 12.3.1981 MEHNER

**Prüffeld für Leistungsbremsen**

Darmstadt, den 27.07.82 Gebig



Für diese Zeichnung behalten wir uns alle Rechte gemäß DIN 34 Abschnitt 2.1 vor.

**CARLSCHENCK**  
 Maschinenfabrik GmbH D-61 Darmstadt

4 PRL 178  
 -Vorderseite

Meßpunkt	1/min	<del>n</del> / <del>Na</del> / <del>fs</del>	<del>N</del> / <del>ZS</del>	30		Be-trieb	WASSER- Lagertemperatur	
				t <sub>OC</sub>	T min		Festl.- SEITE	Loslager- SEITE
WARM-								
LAUF	2570	525.4	144.4			M	54°C	60°C
	2570	525.4	144.4		30	M	54°C	60°C
	5500	15.6	9.0					

**Bemerkungen/Bearstandungen**

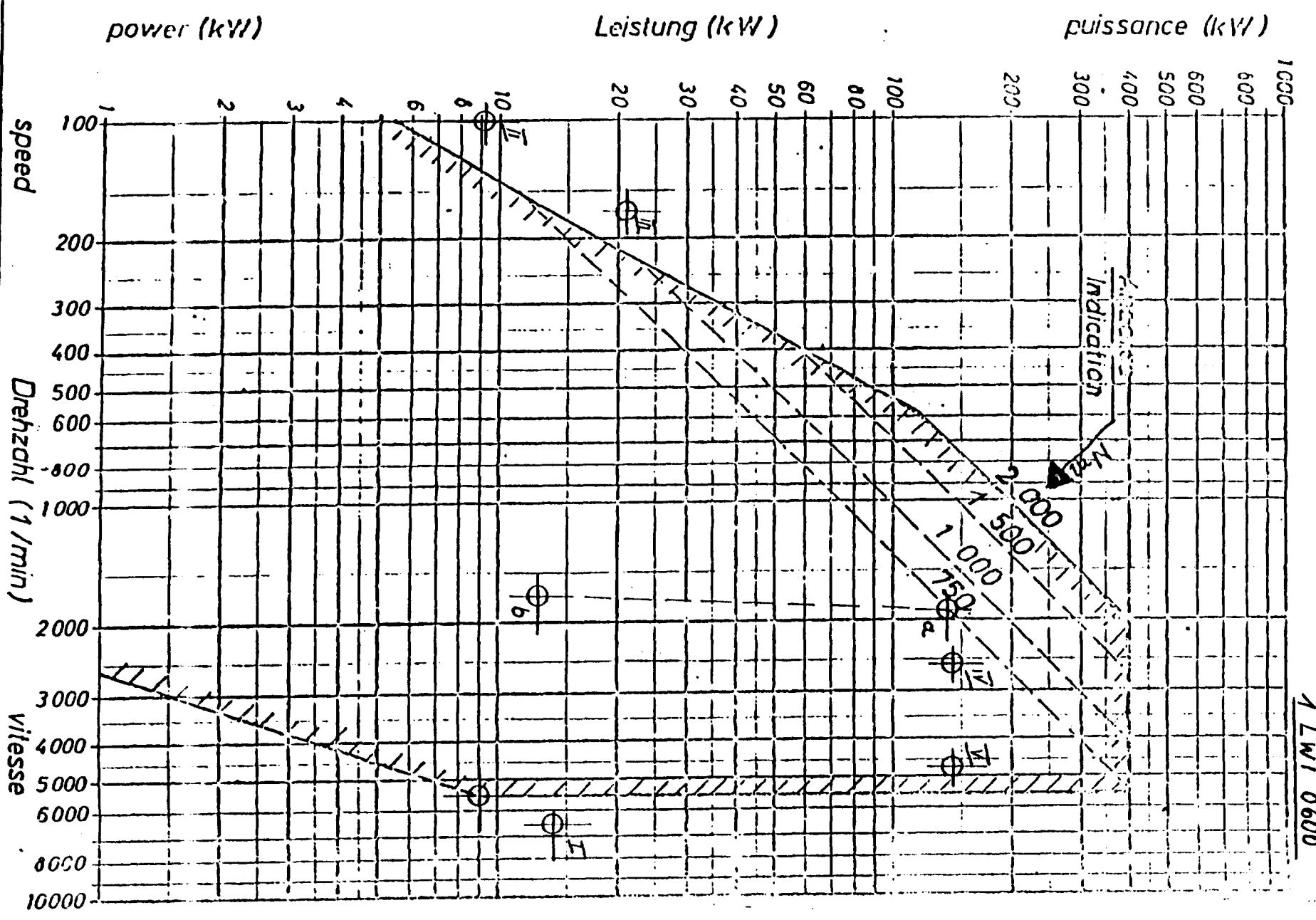
Vorname Nachname 1.1.74  
Name | Datum

Die Firma erklart: Verantwortlich fur  
Korrektheit der Daten sind Hersteller, Sie der  
Verleiher, der Gelehrte, der Sachverständige  
und die vom Hersteller beauftragte Person nicht.



CARL SCHENCK AG

D 5020



Wisselstrombremsel  
W 400

LP7 050

1 LM 0600

# Prüfungs - Protokoll für Bremsen mit elektr. Kraftmeßeinrichtung

Auftrags Nr. 1 LWI 0600 Typ N 400 LZV Nr. 1575-6  
 Höchstlast 2000 Nm Anzeige digital  $3\frac{1}{2}$   $3\frac{3}{4}$   $4\frac{1}{2}$   
 analog GA03 144x144  
 Prüfhebel Länge 1461,0 mm Kraftaufnehmer Typ U2-1E  
 Fabr. Nr. 43 024 Anzeigen Teilung 1 Nm / 10 Nm  
 Drehrichtg. 2 Meßber. 1 Belastung 1 : 15

## Belastung des Kraftaufnehmers

Druck						Zug					
Last aufwärts Nm	Fehler		Last abwärts Nm	Fehler		Last aufwärts Nm	Fehler		Last abwärts Nm	Fehler	
	digital	analog		digital	analog		digital	analog		digital	analog
0	0	0	0	0	0	0	0	0	0	0	0
400	-2	-10	400	-1	0	400	-1	0	400	-1	0
800	-2	-10	800	-1	0	800	0	0	800	-1	0
1200	-2	-10	1200	0	0	1200	+1	+10	1200	0	0
1600	-1	0	1600	0	+10	1600	+1	+10	1600	0	0
2000	0	0				2000	+1	+10			

Bemerkungen \_\_\_\_\_

Prüfer NICKEL Apt. M3D Datum 12.7.1982 Name NICKEL

10.10.82

Für diese Unterlage behalten  
wir uns alle Rechte gemäß  
DIN 34 Abschnitt 2.1 vor.

**CARL SCHENCK AG**  
D-6100 Darmstadt

**PRÜFPROTOKOLL FÜR WIRBELSTROMBREMSEN**

Fert.Nr. : 1 LWF 0172 Serien Nr. : 5 LZV 1649  
 Größe : N.70 Bremsen Nr. : 5  
 A,Z. : L 607.190A Waage WDK Nr. :  
 Kunde : SSA / CEMAGREFF (CHINA) Kraftmeßdose : U2-100kg/Tr.: 11747  
 Besondere Ausrüstung: Luftdose Typ : Nr.:  
 Meßbereich : max 150 N/Nm/ks  
 Tachometer : 0-10.000 1/min

Axialspiel Festlager : 0,10 mm Luftspalt : 1,22 mm

**Planschlag am Flansch Radialschlag am Zapfen**

	M3D	vor PrL	nach PrL		M3D	vor PrL	nach PrL
Festlager			0,01				0,01
Loslager							0,005

2.10 min 2.20 2.30 2.40 2.51 2.52

2.60

Meßpunkt	1/min	N/Nm/ks	KV/PS	t <sub>A</sub> °C	T min	Be-trieb	Lagertemperatur Festl.	Loslager
I	15 600	1,4	2,3		30	M	34°C	23°C
II	310	114,0	3,7			M		
III	420	134,1	5,4			M		
IV	6 118	105,1	67,3	77	1	M		
V	10 000	66,8	70,0		10	M		
VI								

Restanzeige L..... R.....

Kennlinie a - b			
a	2 519	143,3	37,8
b	2 384	54,5	13,4

Anlage geprüft durch : KOLLMANN Datum : 4.5.1981

Gesehen : 4.5.1981

**Prüffeld für Leistungsbremsen**  
 Darmstadt, den 27.07.82 **Gorbig**



Für diese Zeichnung behalten wir uns alle Rechte gemäß DIN 34 Abschnitt 2:1 vor.

**CARLSCHENCK**  
 Maschinenfabrik GmbH D-61 Darmstadt

4 PRL 178  
 Vorderseite

Messpunkt	l/min	N/m <sup>2</sup> /mm	KW/PS	34 t °C	n min	Betrieb	WASSER- Lagertemperatur	
							Festl. SEITE	Loslager- SEITE
WARM								
LAUF	6.118	105.1	67.3			M	58°C	58°C
	6.118	105.1	67.3		30	M	58°C	60°C
	10.900	1.0	1.0					
	13.900	1.2	1.6					

Bemerkungen/Beanstandungen

Für diese Zeichnung behalten wir uns alle Rechte gemäß DIN 34 Abschnitt 2.1 vor.

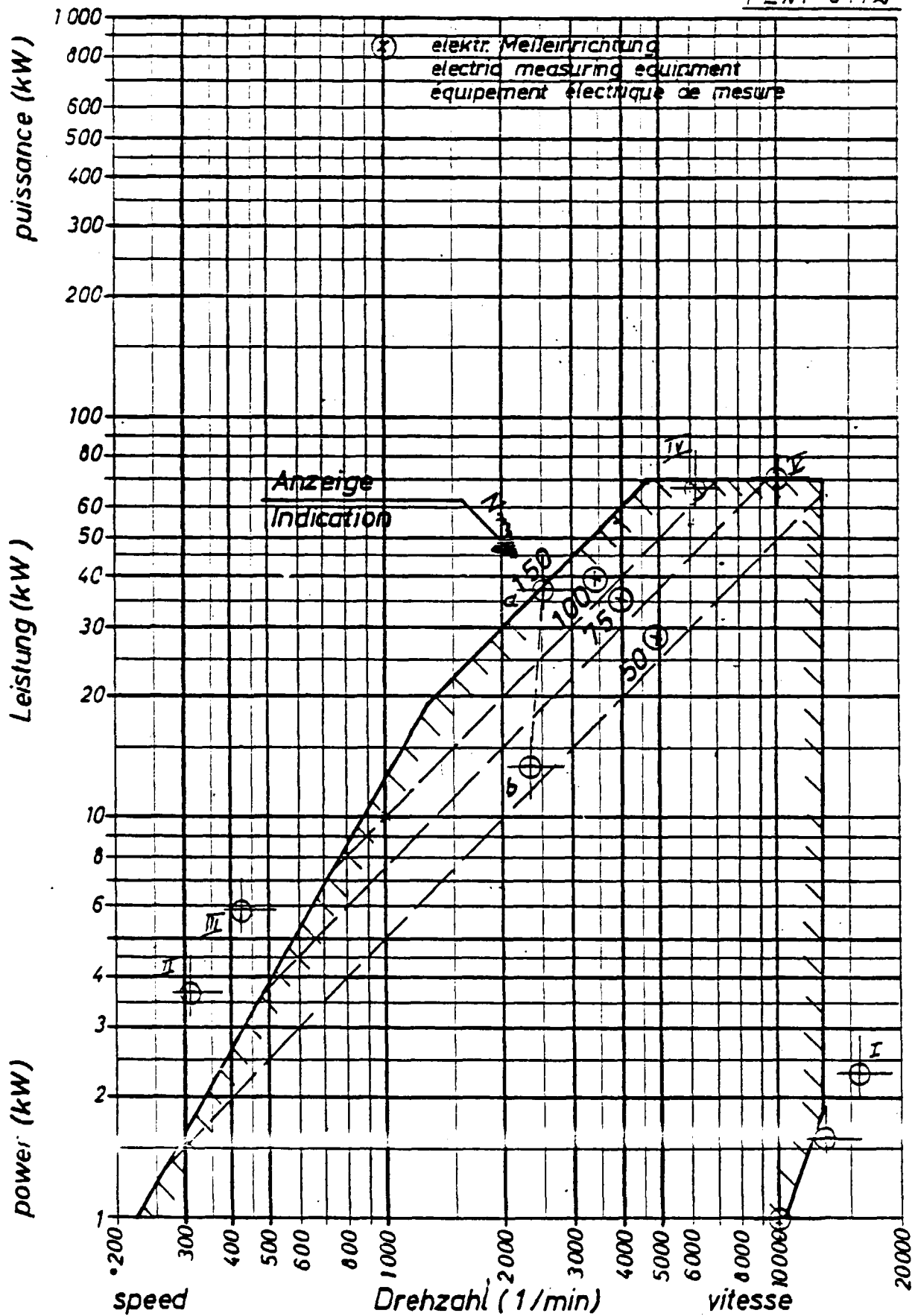
 **CARLSCHENCK**  
Maschinenfabrik GmbH D-61 Darmstadt

4 PRL 178  
Rückseite

Wirbelstrombremse<sup>35</sup>  
W 70

LP7 020

1 LWF 0172



Name  
Datum 1.11.74

Alle Rechte vorbehalten; Vervielfältigung und Weitergabe an Dritte nicht gestattet; Zerstörerhandlungen verpflichten zu Schadenersatz und können strafrechtliche Folgen haben.



CARL SCHENCK AG  
D-61 Darmstadt

D 2020

# Prüfungs-Protokoll für Bremsen mit elektr. Kraftmeßeinrichtung

Auftrags Nr. 1 LWF 0172 Typ W 70 LZV Nr. 1640-5  
 Höchstlast 150 Nm Anzeige digital 3 1/2 ~~3 1/4~~ 4 1/2  
 analog 6503 144 x 144  
 Prüfhebel Länge 1020,0 mm Kraftaufnehmer Typ U2-100Kp  
 Fabr. Nr. 11747 Anzeigen Teilung 0,1 Nm / 1 Nm  
 Drehrichtg. 2 Meißer. 1 Belastung 1 : 1

## Belastung des Kraftaufnehmers

Druck						Zug					
Last aufwärts Nm	Fehler		Last abwärts Nm	Fehler		Last aufwärts Nm	Fehler		Last abwärts Nm	Fehler	
	digital	analog		digital	analog		digital	analog		digital	analog
0	0	0	0	0	0	0	0	0	0	0	0
30	-0,1	0	30	+0,1	0	30	-0,1	-1	30	0	+1
60	-0,1	0	60	+0,1	0	60	-0,1	-1	60	+0,1	0
90	-0,1	0	90	+0,2	0	90	-0,1	-1	90	0	+1
120	-0,1	0	120	+0,1	+1	120	-0,1	-1	120	0	0
150	0	0	↑			150	-0,1	-1	↓		

Bemerkungen \_\_\_\_\_

Prüfer NICKEL Apt. M3D Datum 12.7.1982 Name NICKEL

14.10.80 12.

Für diese Unterlage behalten  
wir uns alle Rechte gemäß  
DIN 34 Abschnitt 2.1 vor.

**CARL SCHENCK AG**  
D-6100 Darmstadt



PRUEFPROTOKOLL FUER WIRBELSTROMBREMSEN  
 PROCES-VERBAL DE CONTROLE POUR FREINS A COURANTS DE FOUCAULT

Fert.Nr. : N° de fabrication  
 Grösse : Type du frein  
 A, Z. : N° de dossier  
 Kunde : Client

.....  
 Besondere Ausrüstung : Equipements particuliers

Serien Nr. : N° de séries  
 Bremsen Nr. : N° de freins  
 Waage WDK Nr. : N° de balance  
 Kraftmessdose : Capteur de force  
 Luftdose Typ : Type du dynamomètre à air comprimé  
 Messbereich : Gamme de mesure  
 Tachometer : Tachymètre

.....  
 =====  
 Axialspiel Festlager : Jeu axial palier fixe  
 Luftspalt : Entrefer

-----  
 Planschlag am Flansch : Voile sur la bride  
 Radialschlag am Zapfen : Excentricité radiale sur le téton

Festlager : Palier fixe  
 Loslager : Palier mobile

Messpunkt (T/min) : Point de mesure (Temps/min.)

Betrieb : Courbe caractéristique

Lagertemperatur : Température de palier

Festl. : Palier fixe

Loslager : Palier mobile

Restanzeige : Indication résiduelle

L : gauche

R : droite

Kennlinie a - b : Caractéristique

Anlage geprüft durch : Matériel vérifié par

Gesehen : vu

Messpunkt : Point de mesure  
l/min : Temps/minute  
Betrieb : Courbe caractéristique  
Wassertemperatur : Température d'eau  
Festl.Seite : Côté du palier fixe  
Loslager-Seite : Côté du palier mobile

Bemerkungen/Beanstandungen : Remarques

PRUEFUNGS-PROTOKOLL FUER BREMSEN  
MIT ELEKTR. KRAFTMESSEINRICHTUNG

PROCES-VERBAL D'ESSAI POUR FREINS EQUIPES  
D'UN DISPOSITIF ELECTRIQUE DE MESURE DE FORCE

Auftrags Nr. : N° de fabrication  
 Ochstlast : Couple max.  
 Prüfhebel Länge : Longueur de bras de levier  
 Fabr. Nr. : N° de fabrication  
 Drehrichtg. : Sens de rotation  
 Typ : Type  
 Anzeige digital : Indication digitale  
 analog : analogique  
 Kraftaufnehmer Typ : Type du capteur de force  
 Anzeigen Teilung : Division d'indication  
 Messbereich : Gamme de mesure  
 Belastung : Charge

---

Belastung des Kraftaufnehmers : Charge du capteur de force

Druck : Compression

Zug : Traction

LAST aufwärts : Charge augmentante

FEHLER digital : ERREUR digitale  
 analog : analogique

LAST aufwärts : Charge décroissante

ERREUR digital : ERREUR digitale  
 analog : analogique

Belastung : Remarques

Prüfer : Technicien

PRUEFPROTOKOLL FUER WIRBELSTROMBREMSSEN  
TEST REPORT FOR EDDY CURRENT DYNAMOMETERS

Fert.Nr. :		Fab. No :	
Grösse :		Size :	
A, Z. :		File No :	
Kunde :		Customer :	
.....		.....	
Besondere Ausrüstung :		Special Equipment .	.....
Serien Nr. :		Serial No :	
Bremsen Nr. :		Dynamometer No :	
Waage WDK Nr. :		Balance No :	
Kraftmessdose :		Force load cell:	
Luftdose Typ :	Nr.	Air load cell type:	No
Messbereich :		Measuring range:	
Tachometer :		Tachometer :	
.....		.....	

---

Axialspiel Festlager :	mm	Axial play (fixed bearing)
Luftspalt :		Air gap :

---

Planschlag am Flansch	Lateral run-out at the flange
Radialschlag am Zapfen	Radial run-out at the journal
Festlager	Fixed bearing
Loslager	Loose bearing
Messpunkt (T/min)	Test point (Time/min)
Betrieb	Characteristic
Lagertemperatur	Temperatur of bearings
Festl.	Fixed bearing
Loslager	Loose bearing
Restanzeige	Residual indication
L	G
R	D
Kennlinie a - b	Characteristic a - b
Anlage geprüft durch	Equipment tested
Gesehen	Seen

Messpunkt

l/min

Betrieb

Wassertemperatur

Festl.Seite

Loslager-Seite

Test point

T/min

Characteristic

Temperatur of water

Side of the fixed bearing

Seide of the Loose bearing

Bemerkungen/Beanstandungen

Remarks

PRUEFUNGS-PROTOKOLL FUER BREMSEN  
MIT ELEKTR. KRAFTMESSEINRICHTUNG

TEST REPORT FOR DYNAMOMETERS WITH ELECTRICAL  
FORCE MEASURING SYSTEM

Auftrags Nr.

Order Nb

Ochstlast

Maximum charge

Prüfhebel Länge

Length of calibration lever

Fabr. Nr.

Production Nb

Drehrichtg.

Directions of the rotation

Typ

Size

Anzeige digital  
analog

Indication digital  
analog

Kraftaufnehmer Typ

Type of the force transducer

Anzeigen Teilung

Graduation of the indicator scale

Messbereich

Measuring range

Belastung

Charge

Belastung des Kraftaufnehmers

Charge of the force transducer

Druck

Compression

Zug

Tension

LAST aufwärts

Increasing CHARGE

FEHLER digital  
analog

ERROR digital  
analog

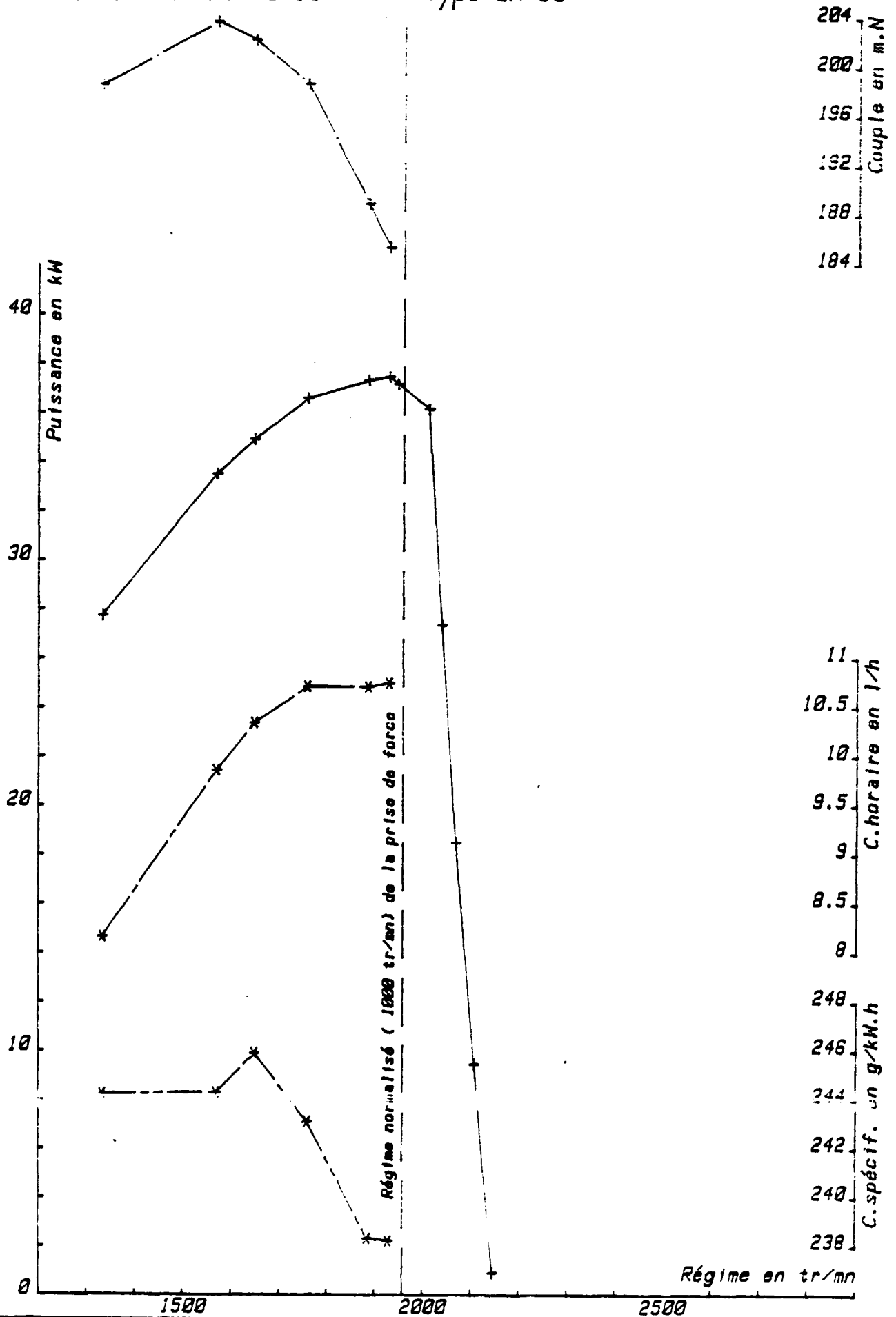
Bemerkungen

Remarks

Annexe II Courbes de l'essai à la prise de force du tracteur  
SHANGHAI 50 sur le frein W 700 et résultats détaillés.  
Compte rendu de l'essai (établi par le Centre).

Essai au banc à la prise de force principale  
 Tracteur SHANGHAI 50 Type SH 50

Essai 1  
 Date 14/09/83

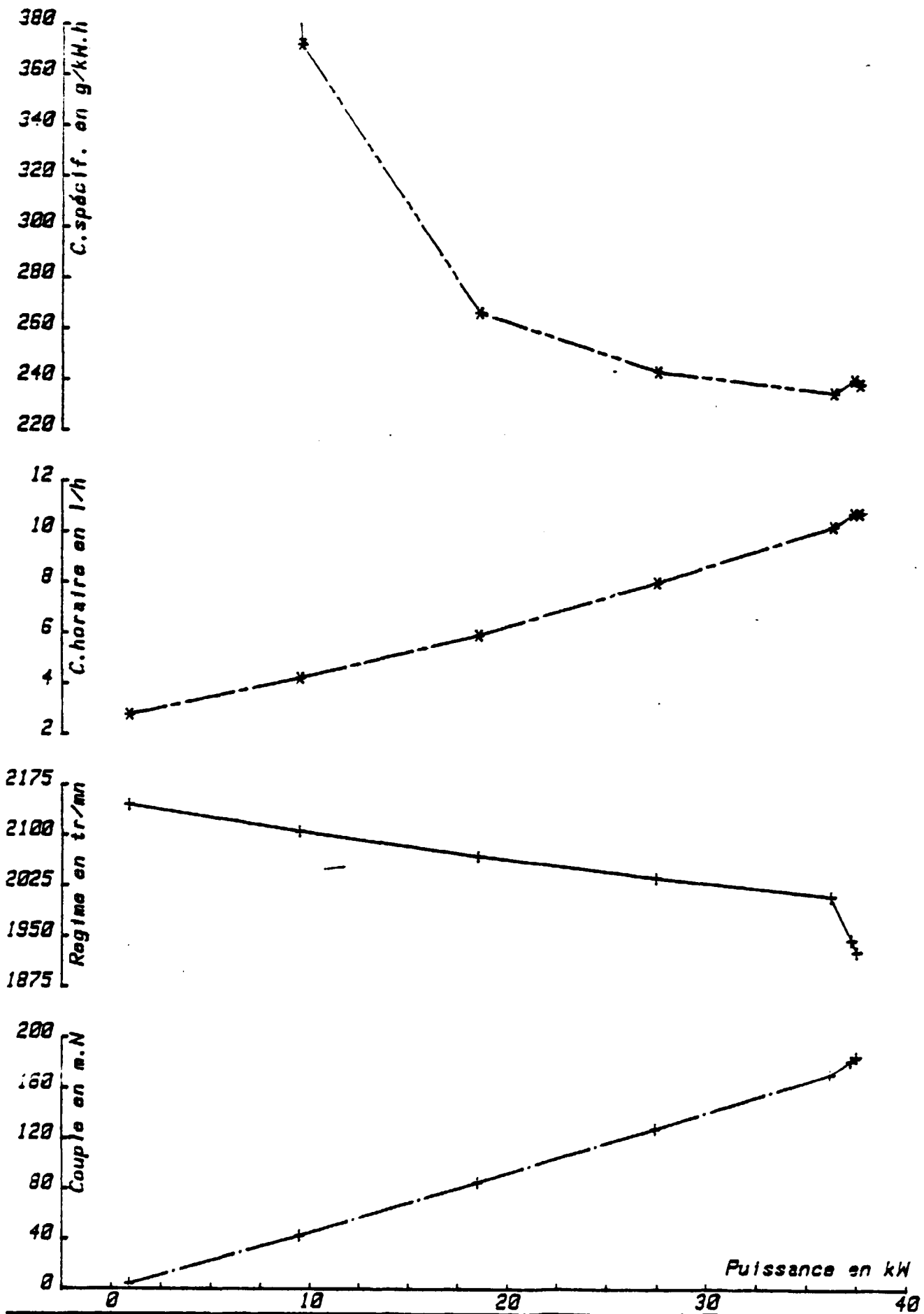




Essai au banc à la prise de force principale  
 Tracteur SHANGHAI 50 Type SH 50

Essai 1  
 Date 14/09/83

Courbes obtenues dans la zone d'action du régulateur



BANC PRISE DE FORCERESULTATS Essai 1

<u>POINT</u>	<u>REGIME</u>	<u>COUPLE</u>	<u>PUISSANCE</u>	<u>C. HORAIRE</u>	<u>C. SPECIFIQUE</u>
7	1333.4	198.672	27.7412	8.16327	244.24
6	1570.32	203.779	33.5101	9.86301	244.293
5	1648.64	202.247	34.9169	10.3448	245.903
4	1758.28	198.672	36.5809	10.7143	243.101
3	1885.55	188.968	37.3127	10.7143	238.334
2	1928.63	185.393	37.4431	10.7463	238.213
1	1946.25	182.329	37.1806	10.7463	240.024
8	2010.87	171.604	36.1358	10.2273	234.91
12	2038.29	128.192	27.3623	8.01782	243.21
9	2069.61	85.2911	18.485	5.93081	266.301
10	2106.81	42.9009	9.46499	4.24028	371.837
11	2145.97	4.0858	.918182	2.7972	2528.56

<u>MT Essai</u>	<u>Date</u>	<u>Marque</u>	<u>Type</u>	<u>Ban</u>	<u>CO</u>	<u>Densi</u>	<u>M/PdF</u>	<u>NC</u>
T 1	14/09/83	SHANGHAI	50 SH 50	780	1	0.83	1.958	4

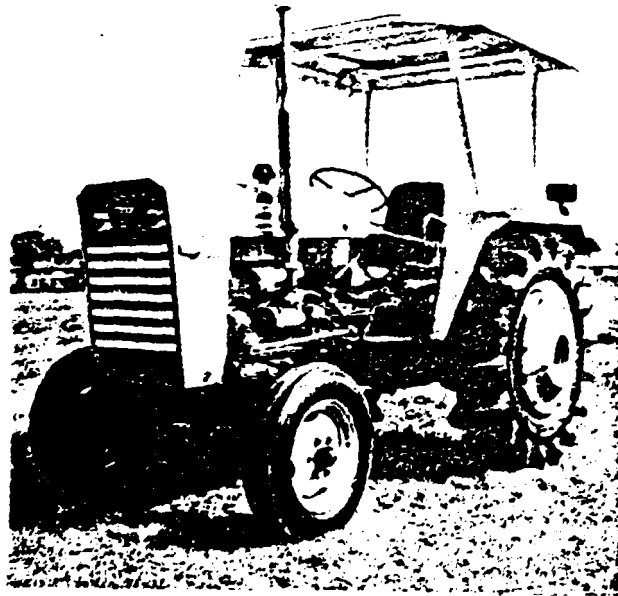
<u>POINT</u>	<u>REGIME(PdF)</u>	<u>TEMPS</u>	<u>COUPLE(PdF)</u>	<u>IMPULSIONS OU POIDS</u>
1	994	33.5	357	100
2	985	33.5	363	100
3	963	33.6	370	100
4	898	33.6	389	100
5	842	34.8	396	100
6	802	36.5	399	100
7	681	44.1	389	100
8	1027	35.2	336	100
9	1057	60.7	167	100
10	1076	84.9	84	100
11	1096	128.7	8	100
12	1041	44.9	251	100

STATION GENERALE D'ESSAIS DES MACHINES AGRICOLES  
DU MINISTERE DE L'AGRICULTURE, DE L'ELEVAGE ET  
DE LA PECHE DE LA REPUBLIQUE POPULAIRE DE CHINE

---

BULLETIN D'ESSAIS

83-001



TRACTEUR: SHANGHAI-50

Le 14 octobre 1983

Nom et adresse du constructeur du tracteur: Usine du tracteur de  
Shanghai

Tracteur soumis aux essais par: Usine du Tracteur de Shanghai

Lieu de rodage: Beijing

Temps de rodage: 52 heures

I. Spécification du tracteur soumis aux essais

- Marque: Shanghai-50
- Modèle: 2 roues motrices
- Type: SH-50
- No de série: 831021

Moteur

- Marque: Shanghai
- Modèle: Diesel, injection directe, 4 temps
- Type: 495A
- No de série: 00693

Cylindres

- Nombre: 4
- Disposition: en ligne
- Alésage/course: 95/115mm
- Cylindree: 3.26 litres
- Rapport de compression: 16.5/1
- Modèle de soupapes: de tête

Dispositifs d'alimentation

- Type, marque et modèle du filtre à combustible: fin à gas-oil C0708
- Capacité du réservoir de carburant: 62 litres
- Type, marque et modèle de la pompe d'injection: à plongeur série I, 4 cylindres, à gauche
- No de série: 81
- Modèle d'injecteur: fermé à cou long
- Pression réglée:  $175 \pm 5 \text{ kgf/cm}^2$

Régulateur de vitesse

- Type: régulateur toutes vitesses

Filtre à air

- Type: filtre à air imprégné d'huile
- Capacité en huile:  $692 \text{ cm}^3$

Dispositifs de graissage

- Contenance du système de graissage: 9 litres
- Type d'huile: pour Diesel HC-11 (été) et HC-14 (hiver)
- Périodicité des vidanges: 125 heures
- Type et nombre de filtres: 1 filtre pression à cartouche papier JOR10
- Périodicité d'échange des filtres: 125 heures

#### Dispositifs de refroidissement

- Type: à eau
- Pompe et ventilateur: pompe centrifuge à ailettes droites en plastiques, ventilateur hélicoïdal aspirateur à 4 pales
- Capacité en eau: 12.4 litres
- Moyen de contrôle de la température: thermostat contrôlant la température de l'eau à l'entrée du radiateur

#### Dispositifs de démarrage

- Type: démarreur 2Q2C
- Puissance: 2.5ch
- Dispositifs auxiliaires de démarrage à basse température: bougie à incandescence

#### Équipement électrique

- Tension: 12V
- Génératrice: 2JF200
- Batterie: 1
  - .Type: au plomb, 3-Q-140
  - .Capacité: 140Ah

#### Silencieux d'échappement

- Longueur totale: 1340mm
- Longueur et diamètre de la chambre d'expansion: 700mm, Ø 110mm

#### Système de transmission

##### Embrayage

- Type: serré, monodisque sec
- Système de commande: par pédale

##### Boîte de vitesses

- Marque: boîte de vitesses à trains parallèles
- Type: mécanique
- Nombre de vitesses: 6 AV. et 2 AR.

##### Essieu arrière et transmission finale

- Type: couple conique et couple droit

## - Blocage de différentiel

.Type: crabotage des deux demi-arbres de roues

.Mode de commande: manuelle par levier

Contenance en huile et huiles recommandées

- Boîte de vitesses )
- Transmission finale ) 34 litres
- Essieu arrière )
- Relevage hydraulique )
- Type d'huile: SYB1103-62S (hiver), SYB1103-62S (été)
- Périodicité des vidanges: 1000 heures

---

Position ;	Nombre de tours du moteur ;	Vitesse d'avancement à la
du levier pour un tour de la roue ;		vitesse nominale du moteur
vitesse ;	motrice ;	(2000tr/mn) du tracteur à
;		pneumatiques: 12.4/11-2 <sup>e</sup> à la
;		pression de 1.4kgf/cm <sup>2</sup>

---

1	;	207.92	;	2.15	km/h
2	;	125.77	;	3.54	"
3	;	66.2 <sup>e</sup>	;	6.71	"
4	;	51.86	;	8.5 <sup>e</sup>	"
5	;	31.4 <sup>e</sup>	;	14.13	"
6	;	16.57	;	26.86	"
AR 1	;	156.75	;	2.84	"
AR 2	;	39.20	;	11.35	"

---

Prise de force

- Crabotage: commande par levier
- Embrayage: serré à sec
- Emplacement: arrière
- Dimensions: 8b-38dc4x32d7x6de4
- Nombre de cannelures: 8
- Hauteur au-dessus du sol: 565mm
- Distance au plan de symétrie du tracteur: 0
- Distance au plan vertical passant par l'axe des roues AR: 280mm
- Régime prise de force: 1000tr/mn
- Régime moteur: 2000tr/mn
- Rapport de transmission: 2
- Sens de rotation: sens des aiguilles d'une montre

Relevage hydraulique

- Type: Contrôle de position, contrôle d'effort
- Type et nombre de vérins: simple, horizontal
- Type de pompe de relevage; piston, 4 cylindres, double rang, horizontal
- Type d'huiles recommandées: No 11 (hiver) et No 14 (été)
- Périodicité des vidanges: 1000 heures

Barre d'attelage oscillante

- Hauteur au-dessus du sol:
  - .Maximum : 925mm
  - .Minimum : 200mm
- Distance du point d'attelage à l'axe de l'essieu AR: 750mm
- Position par rapport à la prise de force:
  - .Verticalement: 95mm
  - .Horizontalement: 423mm
- Dérapement latéral: 300mm
- Position du pivot de la barre oscillante par rapport au milieu de l'axe des roues AR:
  - .Verticalement: 125mm
  - .Horizontalement: 58mm

Chape pour remorque

- Hauteur au-dessus du sol: 510mm
- Distance à l'axe de l'essieu AR: 580mm
- Position par rapport à la prise de force:
  - .Verticalement: 60mm
  - .Horizontalement: 280mm

Direction

- Mode d'action: mécanique

Freins

- Type: à 2 disques, contact par la surface
- Mode d'action: mécanique

Roues directrices

- Nombre: 2
- Position: avant
- Pneumatique:
  - .Dimensions: 6.00-16
  - .Nombre de plis: 6

- Voile: 1318mm
- Mode de réglage: par coulissement de l'essieu  
des matrices
- Nombre: 2
- Position: arrière
- Pneumatiques:
  - .Dimension: 12.4/11-28
  - .Nombre de plis: 6
- Voile: 1358-1404-1510
- Mode de réglage: par échange de roue et voile de gauche contre  
celles de droite
  - .Empattement: 1920mm
  - .Garde au sol: 400mm
  - .Dimensions hors-tout (en mètre)

	Longueur	Largeur	Hauteur toit de	
	mm.	mm.	la cabine	
Avec les dispositifs d'alourdissement	3.000	1.750	1.902	2.340
Sans dispositifs d'alourdissement	3.000	1.650	1.802	2.340

#### Siège du conducteur

- Type d'amortisseur: ressort droit
- Mode de réglage: AV. AR. 40mm
- Carburant et huile employés lors tous les essais

- Carburant:
  - .Type: No 0
  - .Densité: 0.835
- Huile moteur:
  - .Type: HJ-11
- Huile de transmission et de relevage: SYB 1103-62s

#### Conditions d'essais

Masse du tracteur et sa répartition (sans conducteur, réservoirs  
pleins et avec cabine)

	Masse ; Avant ; Arrière ; Total			
Sans dispositifs d'alourdissement	kg	790	1200	2080

( à la page suivante)



Avec dispositifs ;  
d'alourdissement ; kgf ; 870 ; 1650 ; 2520

Alourdissement

	Nombre de Gueuses	Unité	Masse totale	Eau
Avant	4	kgf	80	-
Arrière	6	kgf	360	-

II. Essais à la prise de force principale

- Date et lieu des essais: le 14 septembre 1983
- Type de frein dynamométrique: SCHEMCK W700

Puissance kW	Vitesse		Consommation		
	Moteur (tr/mn)	Prise de force (tr/mn)	Horaire (l/h)	Spécifique (g/kwh)	kwh/l

Essai de 2 heures à la puissance maximale

37.2 ; 1946 ; 994 ; 10.7 ; 240 ; 3.48

Essai à la vitesse normalisée de l'arbre de prise de force:  
1000tr/mn

36.8 ; 1958 ; 1000 ; 10.6 ; 288 ; 3.47

Essais aux charges partielles

(1) A 85% du couple obtenu à la puissance maximale

36.1 ; 2010 ; 1027 ; 10.2 ; 235 ; 3.54

(2) Sans charge

2146 ; 1096 ; 2.8

(3) A 50% de la charge définie en (1)

18.5 ; 2070 ; 1057 ; 5.3 ; 256 ; 3.14

(4) A une charge correspondant à la puissance maximale

37.4 ; 1929 ; 985 ; 10.7 ; 238 ; 3.50

( à la page suivante )

(5) A 25% de la charge définie en (1)

9.5 ; 2107 ; 1076 ; 4.2 ; 372 ; 2.26

(6) A 75% de la charge définie en (1)

27.4 ; 2038 ; 1041 ; 8.0 ; 243 ; 3.43

- Vitesse maximale du moteur à vide: 2146tr/mn
- Couple à la puissance maximale: 185.4Nm
- Valeur maximale du couple: 203.8Nm à 1570tr/mn du moteur
- Conditions atmosphériques moyennes:
  - .Température: 27°C
  - .Pression atmosphérique: 1007.6mbr
- Températures maximales du fonctionnement:
  - .Refroidissement: 61°C
  - .Huile moteur: 108°C
  - .Carburant: 35°C
  - .Air à l'admission au moteur: 36°C

### III. Essais du tracteur sur piste artificielle

- Date des essais: le 9 aout 1983
- Type de piste: en ciment
- Type et dimensions des pneumatiques: 12.4/11-28
- Hauteur de la barre d'attelage: tracteur alourdi: 445mm
- Pression de gonflage: 1.4 kgf/cm<sup>2</sup>

#### Puissance maximale (tracteur alourdi)

Position; levier vitesse ;	Vitesse; d'avan- cement ;	Puissance; à la barre ;	Effort; à la barre ;	Glisse; -ment ;	Consommation en fuel ; Horaire;	spéci- fique par litre	travail ; travail par litre
;	(km/h) ;	(ch) ;	(kgf) ;	(%) ;	(kgf/h);	(g/chh)	(chh/kgf)
2	3.5	18.5	1609	15	7.4	400	2.50
3	5.9	35.1	1600	15	9.1	260	3.86
4	7.6	42.8	1519	12.5	9.9	231	4.32
5	13.2	46.1	943	7	10.2	221	4.52

### IV. Espaces de virage et rayons de braquage

#### Précisions sur l'équipement des roues

- Dimensions: avant 6.00-16; arrière 12.4/11-28
- Voies des roues: avant 1.318m; arrière 1.358m

	Avec freins		Sans freins	
	; A droite (m)	; A gauche (m)	; A droite (m)	; A gauche (m)
Rayons de l'espace ; de virage	3.15	3.20	3.40	3.41
Rayons de braquage ;	3.01	3.06	3.26	3.27

#### V. Position du centre de gravité

- Hauteur au-dessus du sol: 779mm
- Distance du plan vertical contenant l'axe des roues arrière: 663mm
- Distance du plan médian parallèle à l'axe longitudinal du tracteur et passant par le milieu des voies: 8mm

#### VI. Mesure du bruit émis dans l'ambiance par le tracteur

- Date des essais: le 8 octobre 1983
- Type de sonomètre: de précision ND2
- Type de piste: Goudronnée

##### Résultats des essais

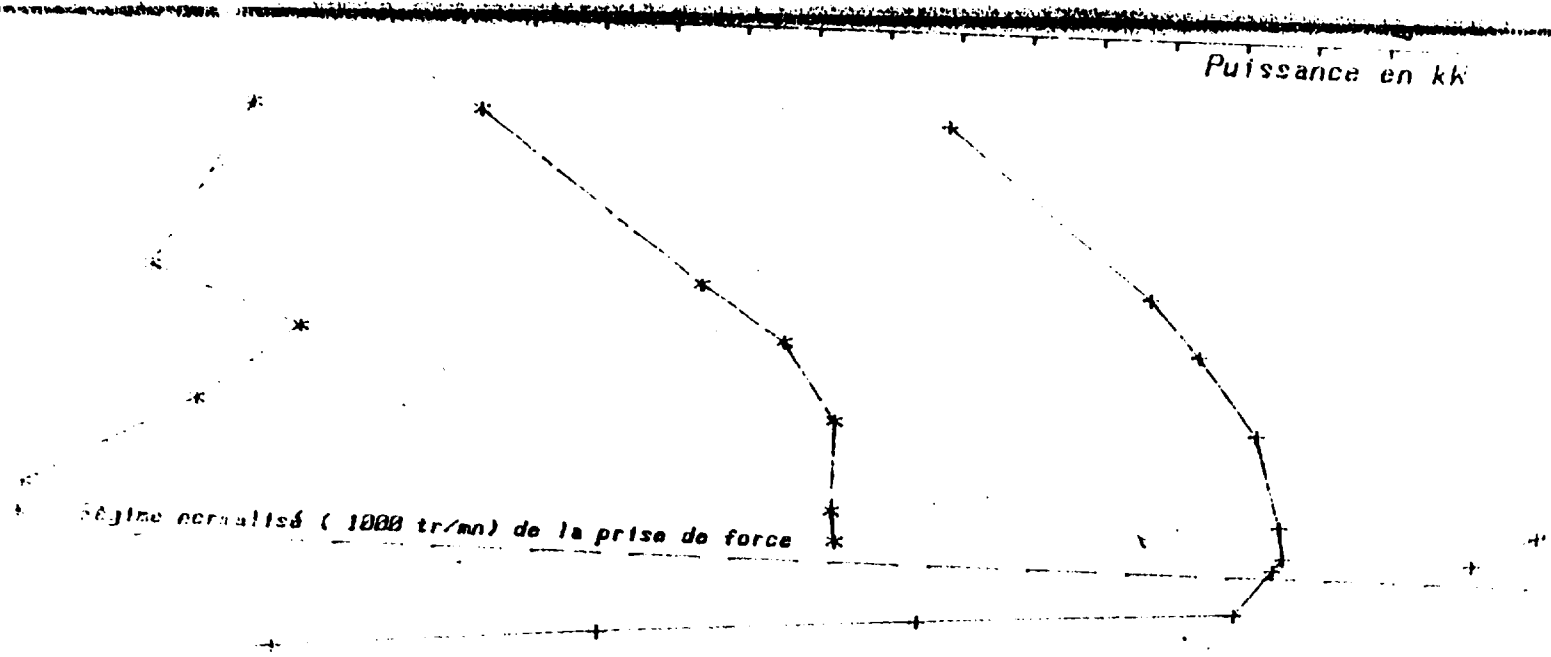
- Vitesse utilisée: 6ème, vitesse théorique: 26.83 km/h;  
vitesse maximale: 31km/h
- Vitesse stabilisée avant accélération: 21km/h
- Bruit (côté échappement): 81 dB(A)

#### VII. Mesure du bruit au niveau des oreilles de l'utilisateur:

- Date des essais: le 8 octobre 1983
- Type de piste: goudronnée
- Type de sonomètre: de précision ND2 ( avec filtre d'octave )
- Tracteur avec une cabine ( non scellée )

##### Résultats des essais

- Vitesse utilisée: 4ème
- Vitesse d'avancement: 6.5km/h
- Bruit: 91.4 dB(A)



1841  
1887  
1991  
2000  
Couple en m.m.

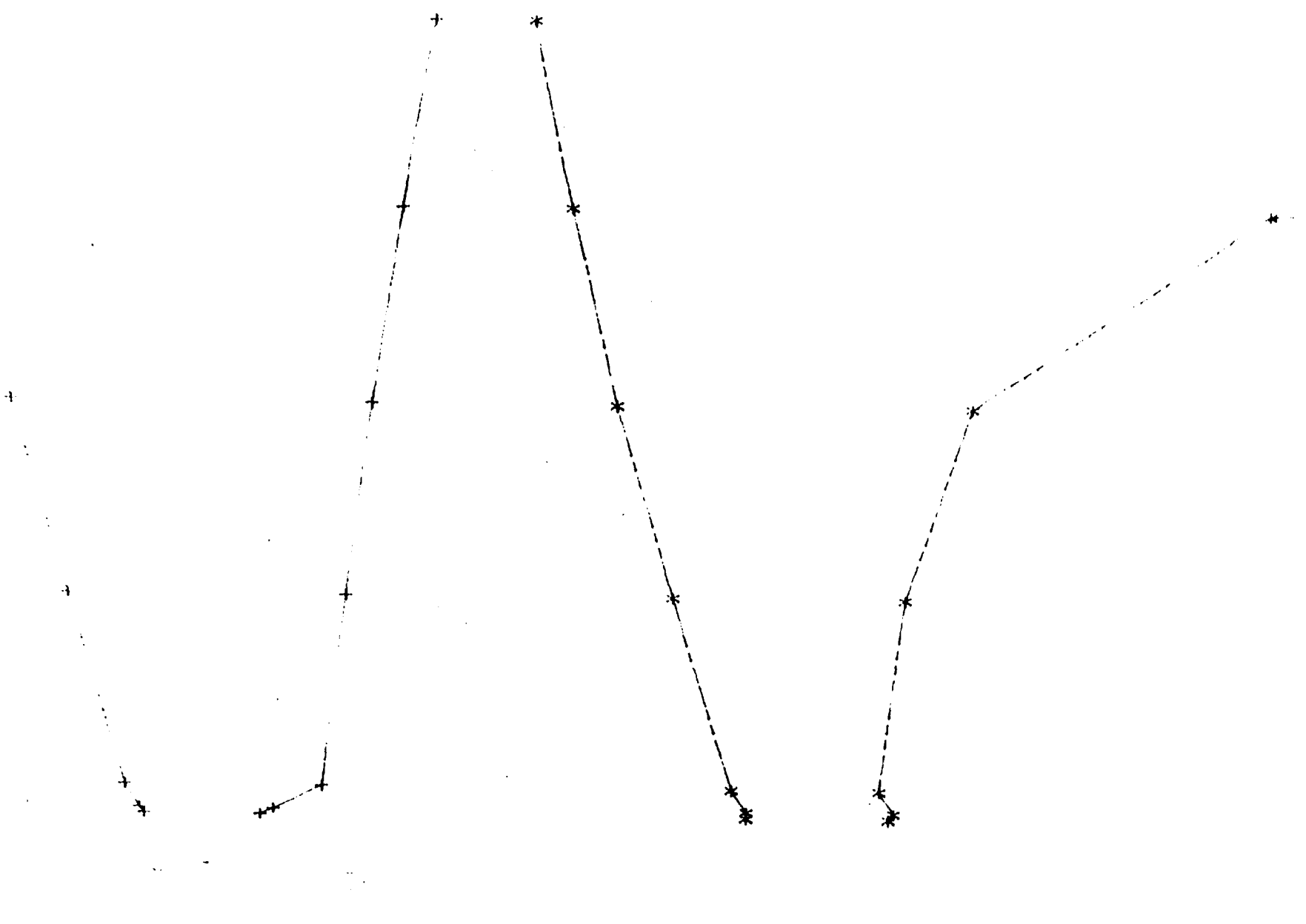
11  
10.5  
10  
9.5  
9  
8.5  
8  
C. horaire en 1/h

248  
245  
244  
242  
240  
238  
236  
234  
232  
230  
228  
226  
224  
222  
220  
218  
216  
214  
212  
210  
208  
206  
204  
202  
200  
198  
196  
194  
192  
190  
188  
186  
184  
182  
180  
178  
176  
174  
172  
170  
168  
166  
164  
162  
160  
158  
156  
154  
152  
150  
148  
146  
144  
142  
140  
138  
136  
134  
132  
130  
128  
126  
124  
122  
120  
118  
116  
114  
112  
110  
108  
106  
104  
102  
100  
98  
96  
94  
92  
90  
88  
86  
84  
82  
80  
78  
76  
74  
72  
70  
68  
66  
64  
62  
60  
58  
56  
54  
52  
50  
48  
46  
44  
42  
40  
38  
36  
34  
32  
30  
28  
26  
24  
22  
20  
18  
16  
14  
12  
10  
8  
6  
4  
2  
0  
en 1/kW.h

RECHERCHES SUR LE ...

Courbes de temps dans la zone d'action du régulateur

Couple en m.N      Regime en tr/mn      C.horaire en l/h      C.spécif. en g/kwh

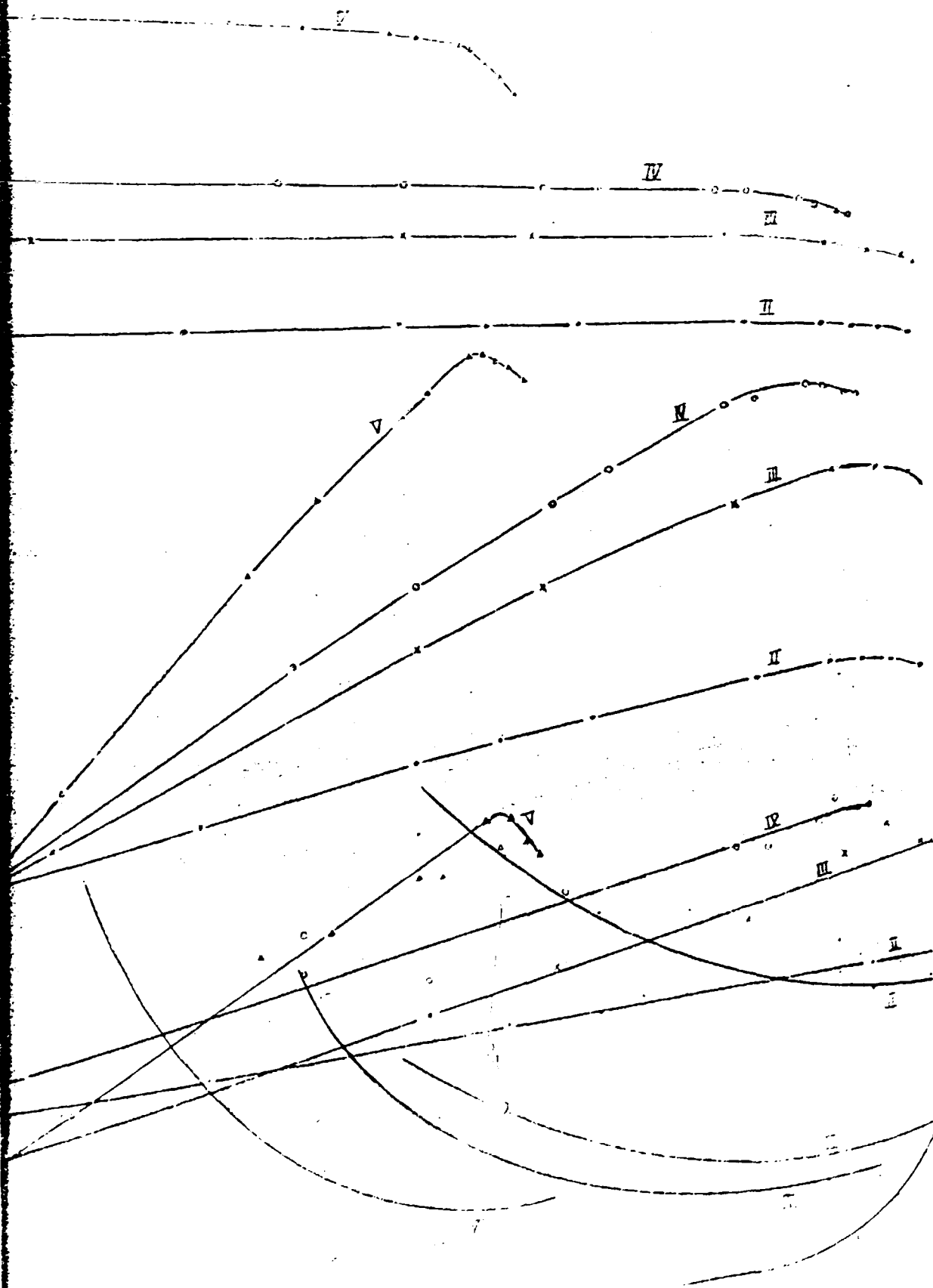


... ..

(... ..)

DATE: 7/3/1983

ESMA No 33-001



2.19

3.27

2.1

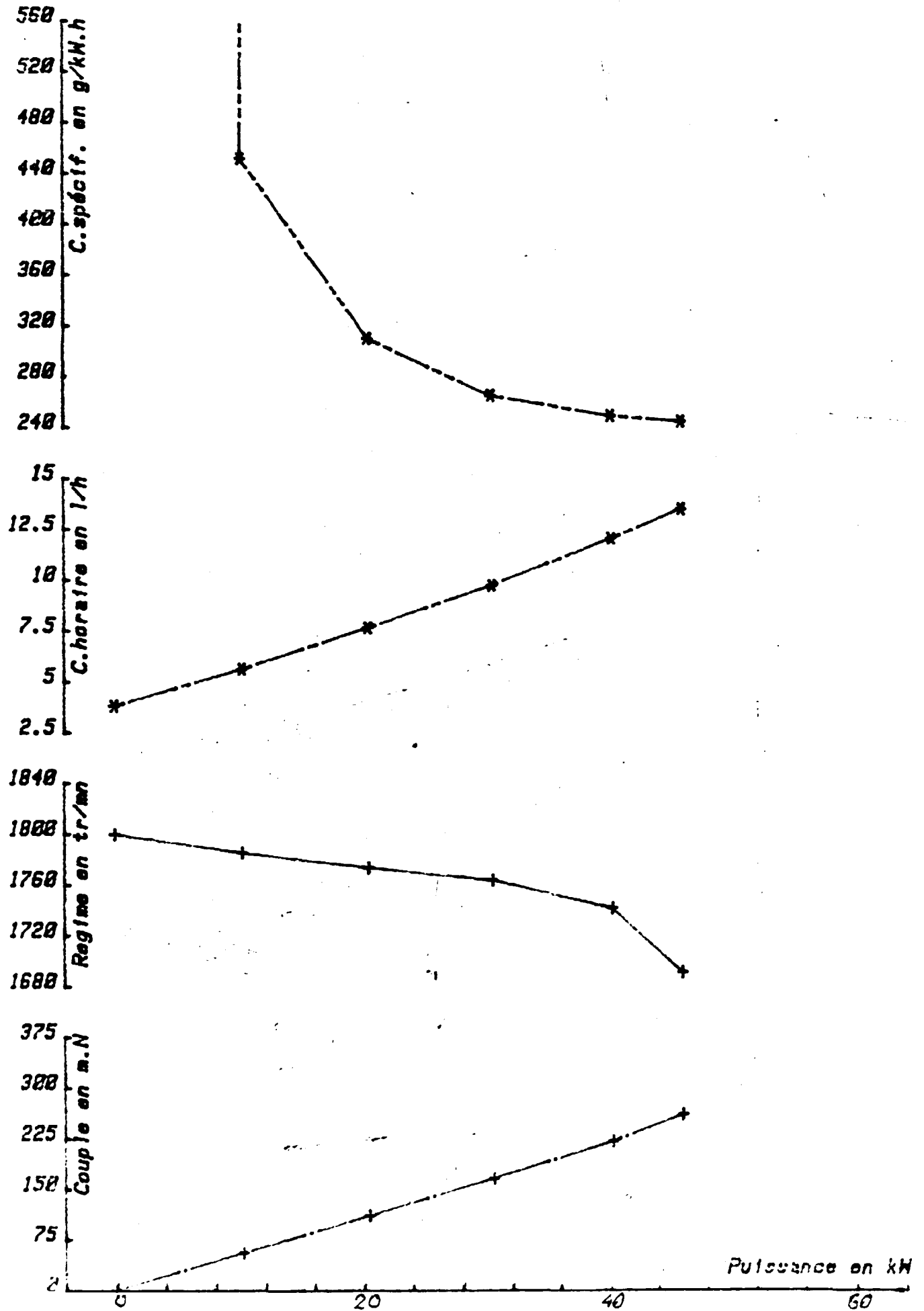
2.1

Annexe III Courbes de l'essai à la prise de force du tracteur  
TIENU 65 sur le frein W 400

Essai au banc à la prise de force principale  
Tracteur TIENU65 Type TN65

Essai 03006  
Date 28/09/83

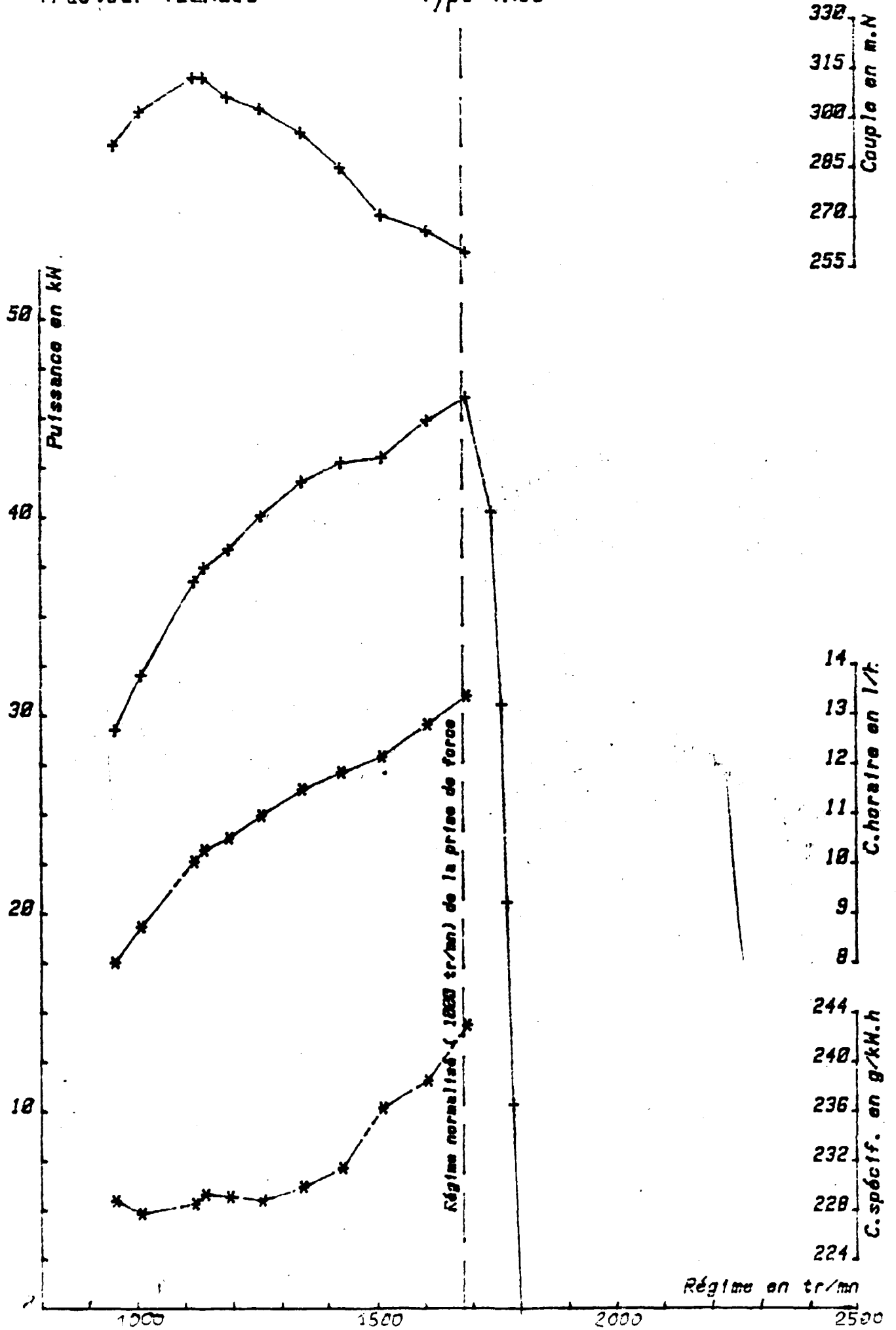
Courbes obtenues dans la zone d'action du régulateur



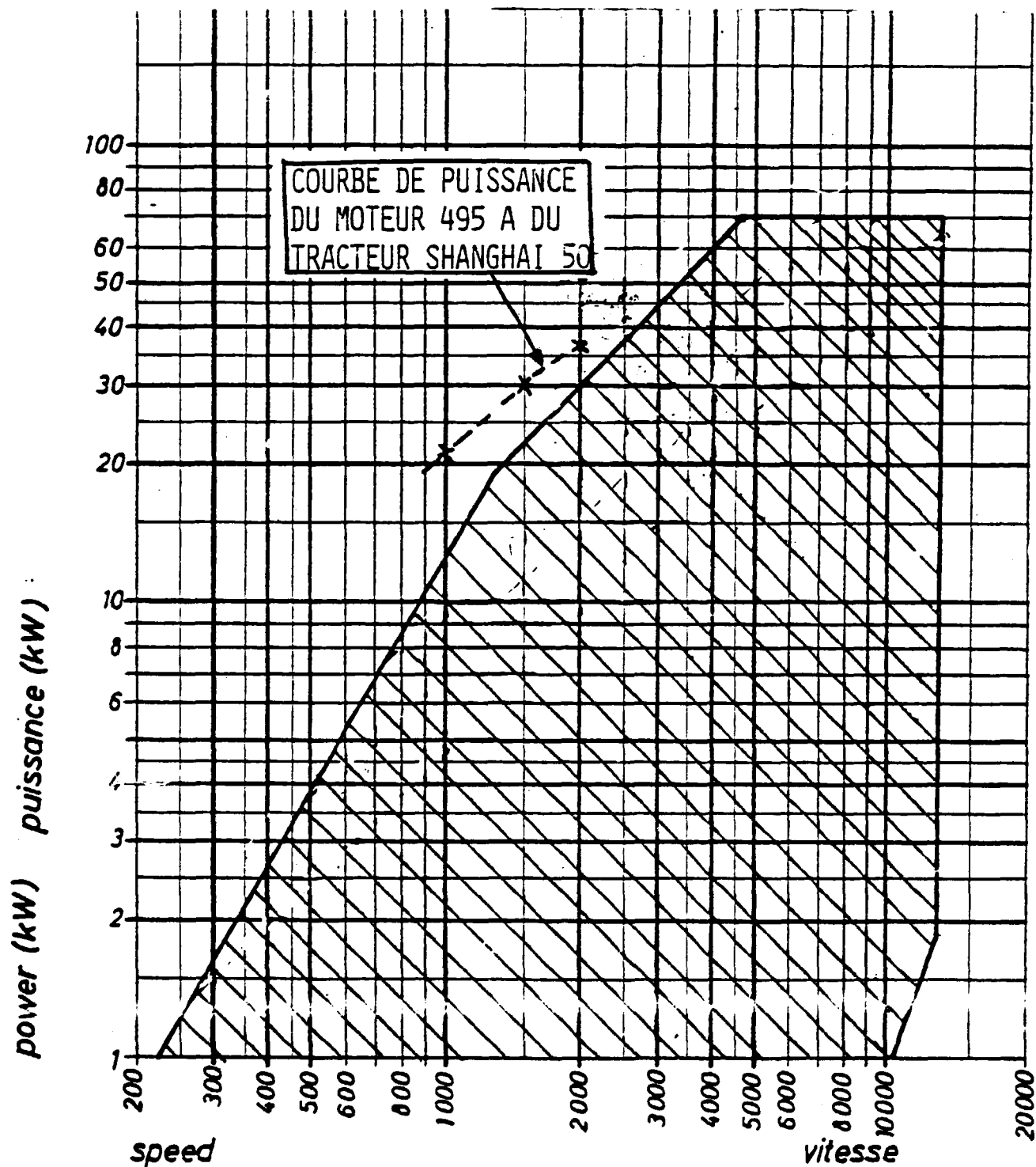


Essai au banc à la prise de force principale  
 Tracteur TIENU65 Type TN65

Essai 83086  
 Date 28/09/83



Annexe IV COURBE D'ABSORPTION DU FREIN SCHENCK W70  
 ET PUISSANCE DU MOTEUR 495 A DU TRACTEUR  
 SHANGHAI 50



Annexe V Courbes de l'essai du moteur 495 A du tracteur  
SHANGHAI 50 sur le frein W 400 et résultats détaillés.  
Compte rendu de l'essai (établi par le Centre).

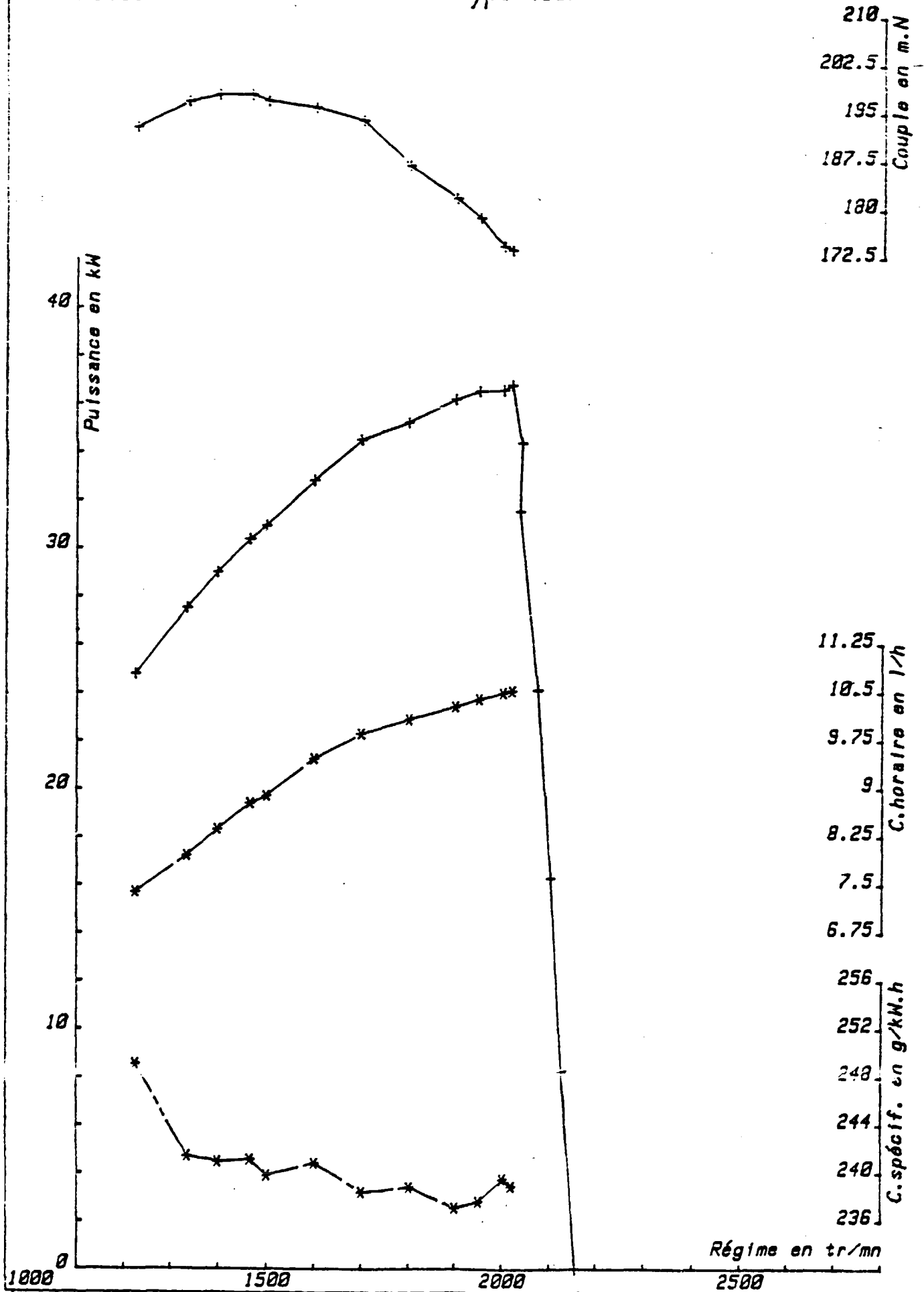
# Essai au banc de moteur

Moteur 495A

Type 495A

Essai 83-204

Date 26/9/83



Essai au banc de moteur

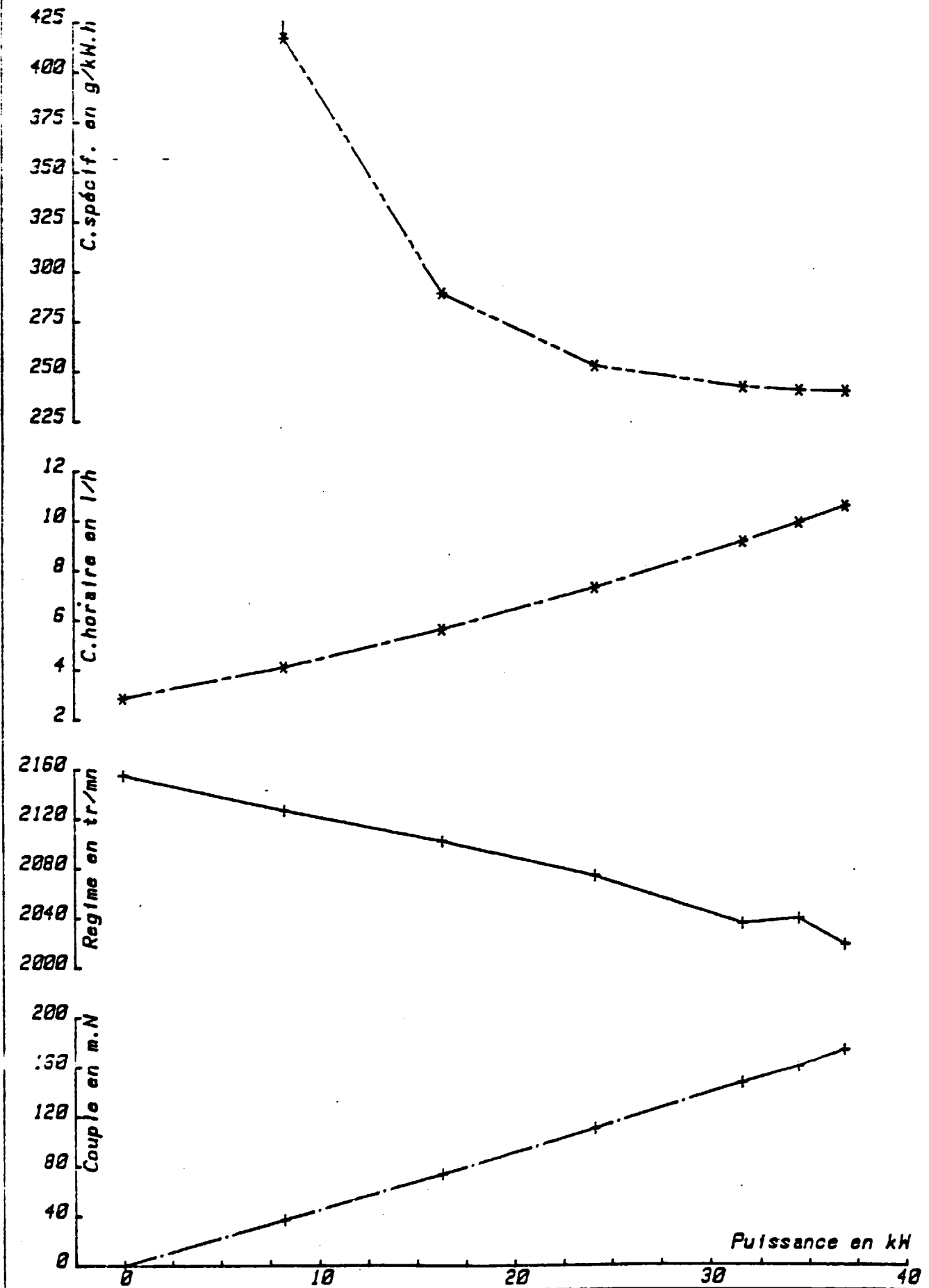
Moteur 495A

Type 495A

Essai 83-024

Date 26/9/83

Courbes obtenues dans la zone d'action du régulateur



## RESULTATS Essai 83-004

<u>POINT</u>	<u>REGIME</u>	<u>COUPLE</u>	<u>PUISSANCE</u>	<u>C. HORAIRE</u>	<u>C. SPECIFIQUE</u>
13	1226	193	24.7786	7.3922	249.106
12	1335	197	27.5408	7.9646	241.476
11	1399	198	29.3076	8.37209	240.995
10	1466	198	30.3968	8.78049	241.2
9	1500	197	30.9447	8.88889	239.854
8	1600	196	32.8401	9.47368	240.88
7	1700	194	34.5366	9.86301	238.46
6	1800	187	35.2487	10.084	238.878
5	1900	182	36.2121	10.2857	237.174
4	1950	179	36.5524	10.4046	237.682
1	2001	174.6	36.5864	10.4956	239.538
2	2019	174	36.7887	10.5263	238.917
3	2040	161	34.3941	9.86301	239.448
14	2036	148	31.555	9.11392	241.17
15	2074	111	24.1079	7.27273	251.898
16	2102	74	16.2889	5.625	288.348
17	2127	37	8.24134	4.10959	416.377
18	2155	.001	.000225671	2.85261	10554900

<u>MT Essai</u>	<u>Date</u>	<u>Marque</u>	<u>Type</u>	<u>Ban</u>	<u>CO</u>	<u>Densi</u>	<u>M/PdF</u>	<u>NC</u>
M 83-004	26/9/83	495A	495A	400	1	0.835	1	4

<u>POINT</u>	<u>REGIME(PdF)</u>	<u>TEMPS</u>	<u>COUPLE(PdF)</u>	<u>IMPULSIONS OU POIDS</u>
1	2001	34.3	174.6	100
2	2019	34.2	174	100
3	2040	36.5	161	100
4	1950	34.6	179	100
5	1900	35	182	100
6	1800	35.7	187	100
7	1700	36.5	194	100
8	1600	38	196	100
9	1500	40.5	197	100
10	1466	41	198	100
11	1399	43	198	100
12	1335	45.2	197	100
13	1226	48.7	193	100
14	2036	39.5	148	100
15	2074	49.5	111	100
16	2102	64	74	100
17	2127	87.6	37	100
18	2155	126.2	.001	100

STATION GENERALE D'ESSAIS DES MACHINES AGRICOLES  
DU MINISTERE DE L'AGRICULTURE, DE L'ELEVAGE ET  
DE LA PECHE DE LA REPUBLIQUE POPULAIRE DE CHINE

BULLETIN D'ESSAIS

83-004

MOTEUR 495 A

LE 14 OCTOBRE 1983

Nom et adresse du constructeur du moteur: Usine d'Engin de  
Combustion interne de Shanghai

Moteur soumis aux essais par: idem

Lieu de rodage: Shanghai

I. Spécification du moteur soumis aux essais

- Marque: Shanghai
- Modèle : Diesel, injection directe, 4 temps
- Type: 495A
- No de série: 00693

Cylindre

- Nombre: 4
- Disposition: en ligne
- Alésage/course: 95/115mm
- Cylindrée: 3.26 litres
- Rapport de compression: 16.5/1
- Modèle de soupapes: de tête

Dispositifs d'alimentation

- Type, marque et modèle du filtre à combustible: fin à gas-  
oil C0708
- Capacité du réservoir de carburant : 62 litres
- Type, marque et modèle de la pompe d'injection: à plongeur  
série I, 4 cylindres, à gauche
- No de série: 81
- Type, marque et modèle d'injecteur: fermé à cou long
- Pression réglée: 175<sub>±</sub> 5kgf/cm<sup>2</sup>

Régulateur de vitesse

- Type: régulateur toutes vitesses

Filtre à air

- Type : filtre à air imprégné d'huile
- Capacité en huile: 692cm<sup>3</sup>

Dispositifs de graissage

- Contenance du système de graissage: 9 litres
- Type d'huile: pour Diesel No HC-11 (hiver) et HC-14 (été)
- Périodicité des vidanges: 125 heures



- Type et nombre de filtres: 1 filtre pression à cartouche papier J0810

- périodicité d'échange des filtres: 125 heures

Dispositifs de refroidissement

- Type: à eau

- Pompe et ventilateur: pompe centrifuge à ailettes droites en plastique , ventilateur hélicofidal aspirateur à 4 pales

- Capacité en eau: 12.4 litres

- Moyen de contrôle de la température: thermostat contrôlant la température de l'eau à l'entrée du radiateur

Dispositifs de démarrage

- Type et puissance: 2Q2C, 2.5ch

- Dispositifs auxiliaires de démarrage à basse température: bougie à incandescence

Equipement électrique

- Tension: 12v

- Génératrice: 2JF200

- Batterie: 1

.Type: au plomb, 3-Q-140

.Capacité: 140Ah

Silencieux d'échappement

- Longueur totale: 1340mm

- Longueur et diamètre de la chambre d'expansion: 700mm, Ø 110mm

II. Essais du moteur

- Date et lieu des essais: le 26 septembre 1983

- Type de frein dynamométrique: SCHENCK W400

---

Puissance; Vitesse du				consommation
moteur	;	Horaires	;	Spécifique ; kw.h/l
(kw)	;	(tr/mn)	;	(l/h) ; (g/kw.h) ;

---

Essai de 2 heures à la puissance maximale

36.6 ; 2001 ; 10.5 ; 240 ; 3.49

---

( à la page suivante )

## Essais aux charges partielles

(1) A 85% du couple obtenu à la puissance maximale

31.6 ; 2036 ; 9.1 ; 241 ; 3.47

(2) Sans charge

; 2155 ; 2.9 ; ;

(3) A 50% de la charge définie en (1)

16.3 ; 2102 ; 5.6 ; 288 ; 2.91

(4) A une charge correspondant à la puissance maximale

36.8 ; 2019 ; 10.52 ; 239 ; 3.50

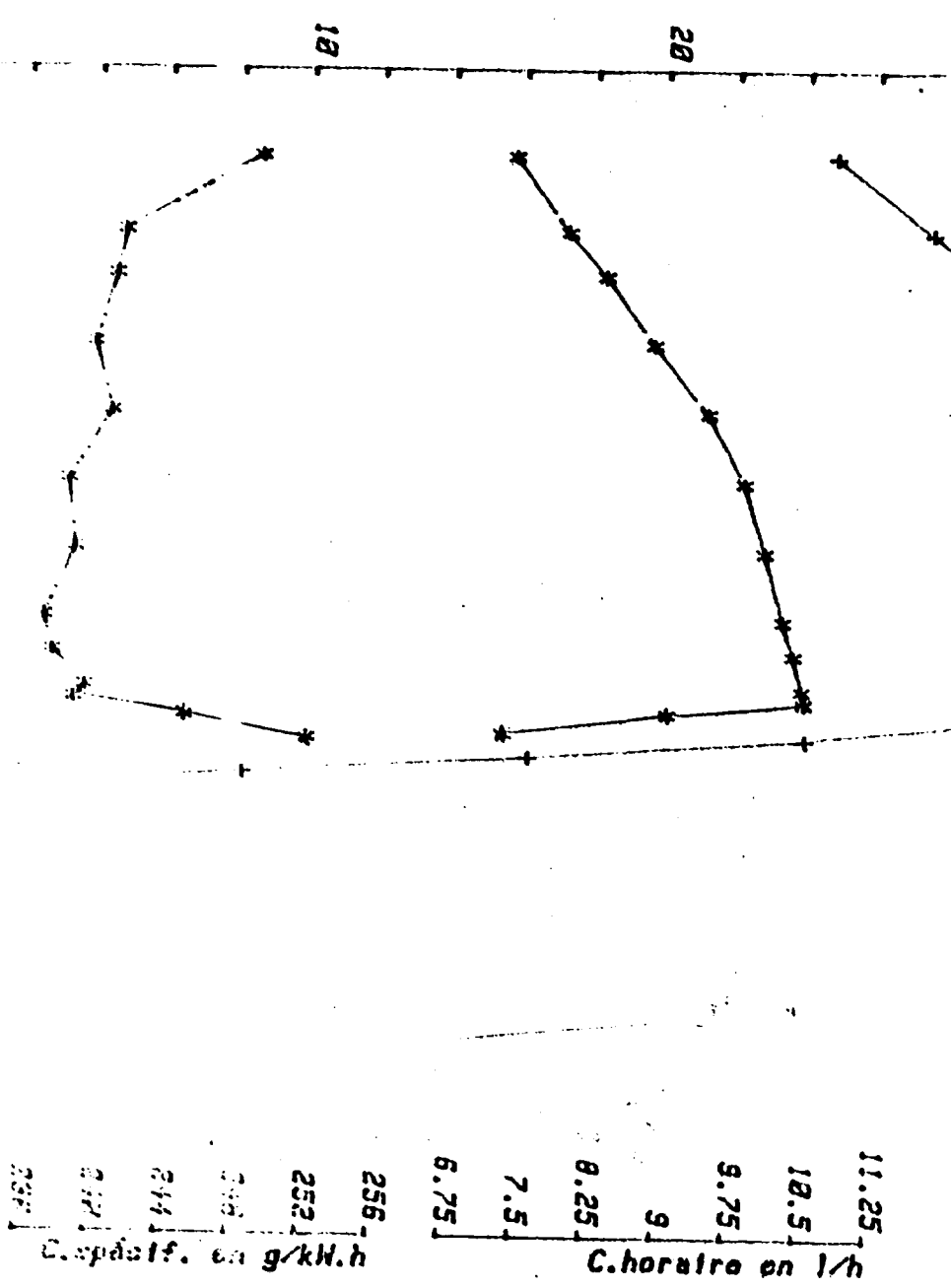
(5) A 25% de la charge définie en (1)

8.2 ; 2127 ; 4.1 ; 416 ; 2.00

(6) A 75% de la charge définie en (1)

24.1 ; 2074 ; 7.3 ; 252 ; 3.30

- Vitesse maximale du moteur à vide: 2155 tr/mn
- Couple à la puissance maximale: 174Nm
- Valeur maximale du couple: 198 Nm a 1399 tr/mn du moteur
- Température atmosphérique moyenne: 27°C
- Température maximale de fonctionnement:
  - .Refroidissement: 73°C
  - .Huile-moteur: 96°C
  - .Carburant: 31°C
  - .Air à l'admission au moteur: 30°C



C. spādf. en g/kW.h

C. horaire en l/h

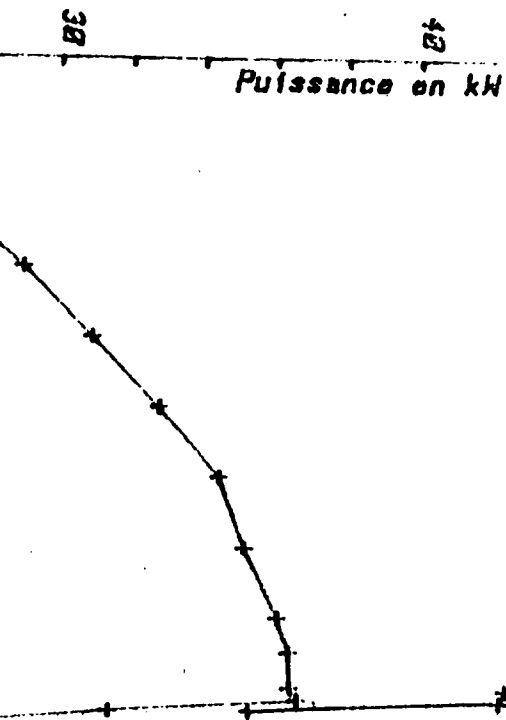
Essai en banc de moteur

71

Moteur 455R

Type 455R

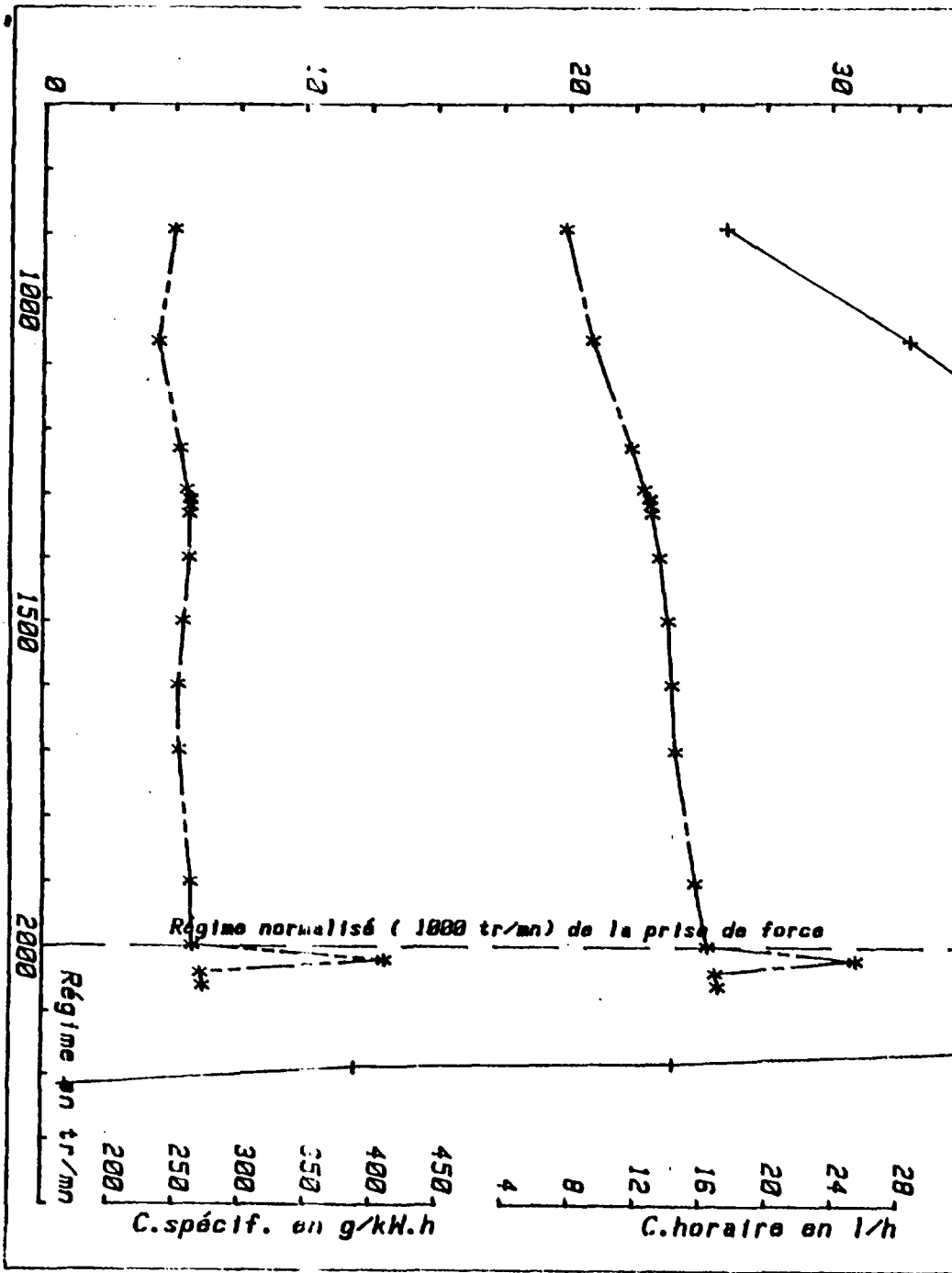
Essai 93-004  
Date 26/05/83



210  
202.5  
195  
187.5  
180  
172.5

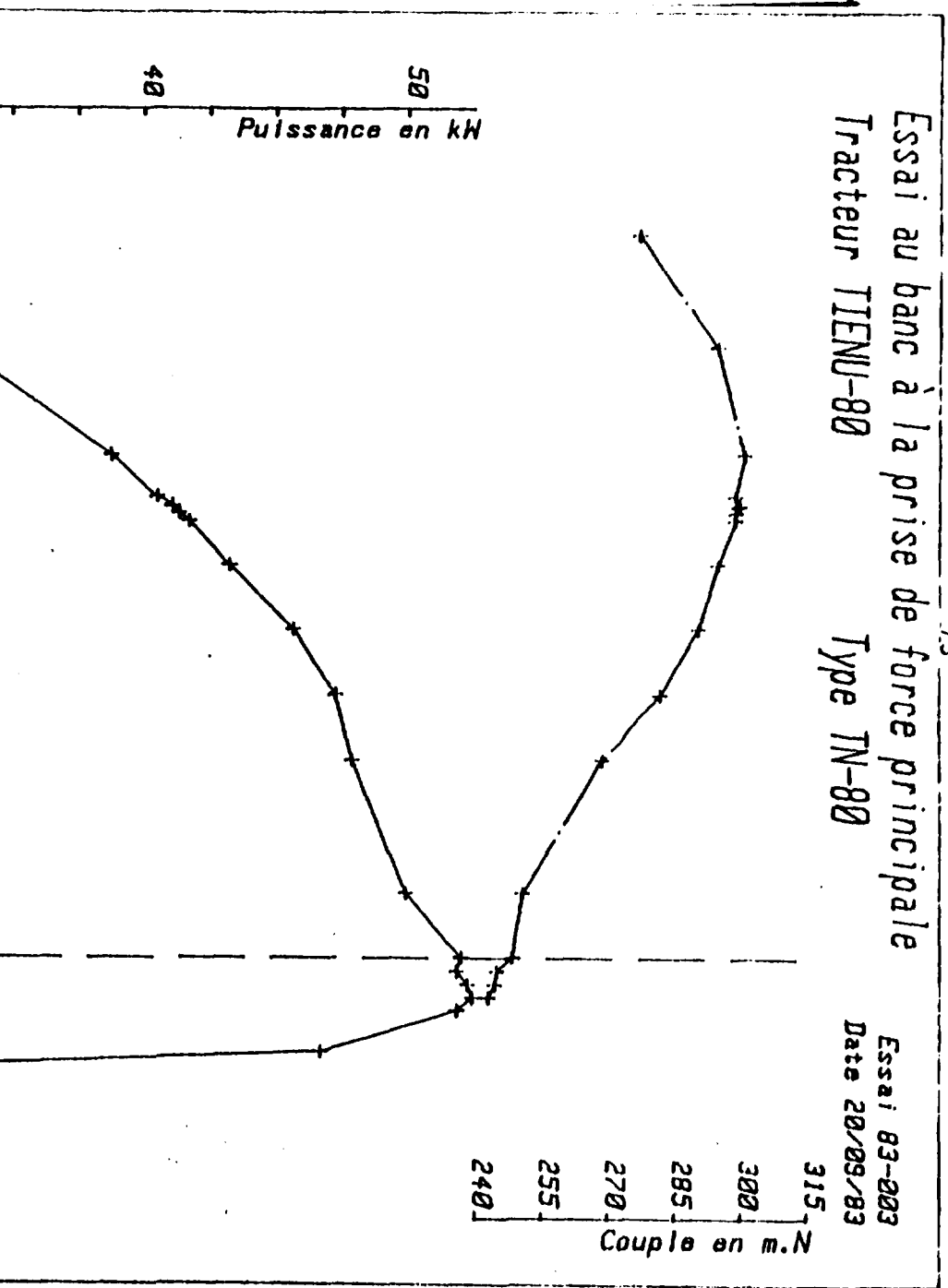
Couple en n.m.

Annexes VI Courbes de l'essai à la prise de force du tracteur  
TIENU-80 sur le frein W 700 et résultats détaillés.



Essai au banc à la prise de force principale  
Tracteur TIENU-80 Type TN-80

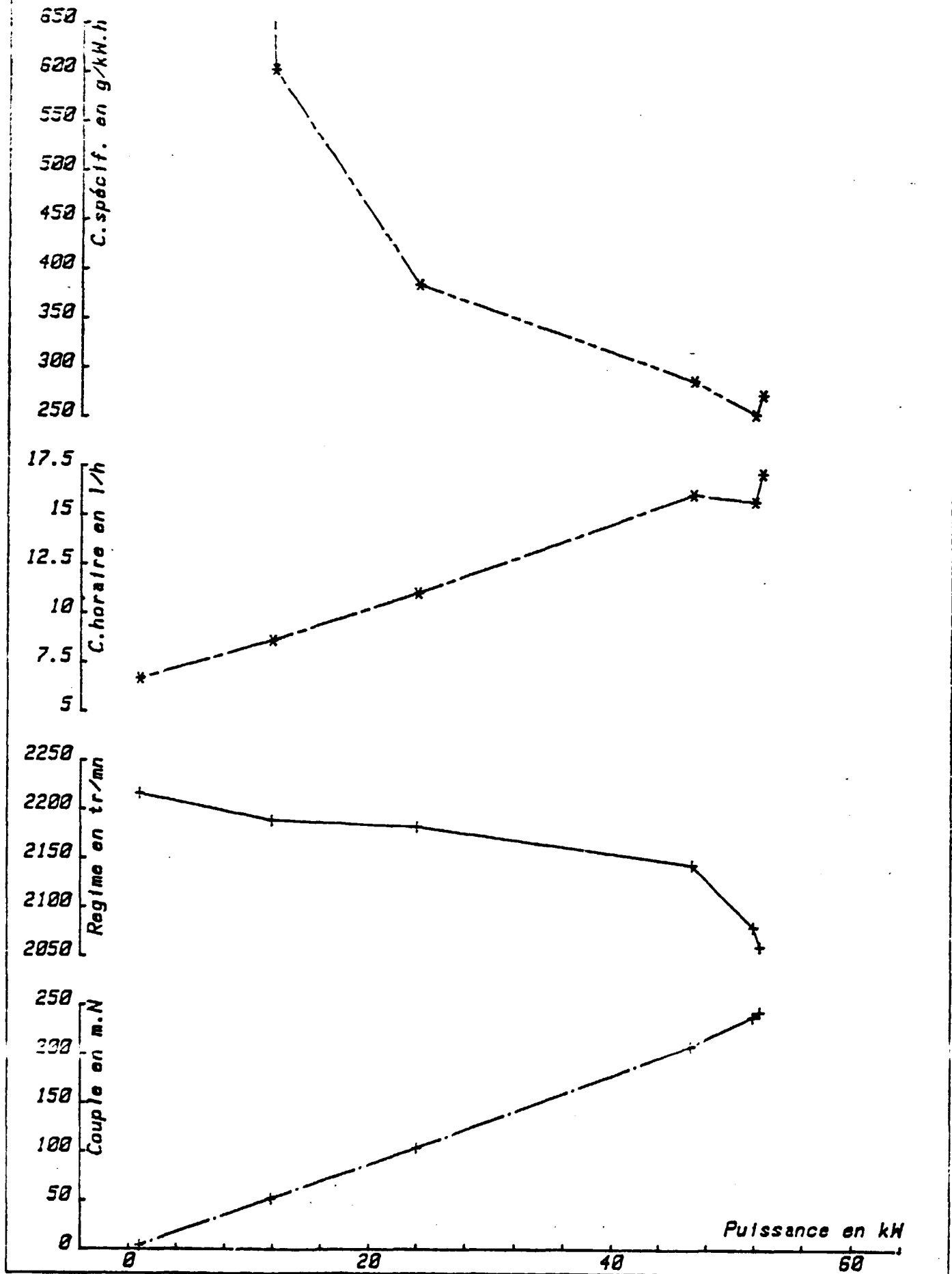
Essai 83-003  
Date 20/09/83



# Essai au banc à la prise de force principale Tracteur TIENU-80 Type TN-80

Essai 83-003  
Date 20/09/83

Courbes obtenues dans la zone d'action du régulateur





RESULTATS Essai 83-003

<u>POINT</u>	<u>REGIME</u>	<u>COUPLE</u>	<u>PUISSANCE</u>	<u>C. HORAIRE</u>	<u>C. SPECIFIQUE</u>
17	894	277.5	25.9794	7.79221	250.448
18	1066	295	32.9312	9.39948	238.332
16	1230	301	38.7704	11.8421	255.044
15	1294	299	40.5167	12.6316	260.322
14	1308	300	41.092	12.9496	263.139
13	1310	299.5	41.0863	12.9496	263.176
12	1320	299	41.3308	13.0435	263.516
11	1332	299	41.7065	13.0909	262.091
10	1400	295	43.2492	13.5849	262.28
9	1500	290.5	45.6316	14.0625	257.326
8	1600	282	47.2495	14.3426	253.465
7	1700	269	47.8883	14.5749	254.134
6	1900	251	49.9108	15.7895	263.997
5	1998	248.5	51.9937	16.5138	265.206
1	2020	245	51.8258	25.5319	411.361
2	2040	244.5	52.2321	16.9811	271.466
3	2060	243	52.4206	17.1429	273.067
4	2080	238	51.8404	15.7205	253.212
19	2144	208	46.7	16.0714	287.358
20	2182	105	23.9923	11.0429	384.324
21	2188	52	11.9146	8.59189	602.138
22	2216	4	.928236	6.67904	6008.17

<u>MT Essai</u>	<u>Date</u>	<u>Marque</u>	<u>Type</u>	<u>Ban</u>	<u>CO</u>	<u>Densi</u>	<u>M/PdF</u>	<u>NC</u>
T 83-003	20/09/83	TIENU-80	TN-80	780	1	0.835	2	4

<u>POINT</u>	<u>REGIME(PDF)</u>	<u>TEMPS</u>	<u>COUPLE(PDF)</u>	<u>IMPULSIONS OU POIDS</u>
1	1010	14.1	490	100
2	1020	21.2	489	100
3	1030	21	486	100
4	1040	22.9	476	100
5	999	21.8	497	100
6	950	22.8	502	100
7	850	24.7	538	100
8	800	25.1	564	100
9	750	25.6	581	100
10	700	26.5	590	100
11	666	27.5	598	100
12	660	27.6	598	100
13	655	27.8	599	100
14	654	27.8	600	100
15	647	28.5	598	100
16	615	30.4	602	100
17	447	46.2	555	100
18	533	38.3	590	100
19	1072	22.4	416	100
20	1091	32.6	210	100
21	1094	41.9	104	100
22	1108	53.9	8	100

Annexe VII Liste des Ingénieurs et techniciens du Centre ayant participé à la mission du consultant

Division 1 (Essais au banc de tracteurs et de moteurs)

M. WANG YANXIANG, Ingénieur, Chef de Division

M. WANG LIANSHANG, Ingénieur Adjoint au Chef de Division

M. LI XIJIANG, Ingénieur

M. ZHAO JIANZHONG, Technicien

M. BAI YOCHUN, Technicien

Division 2 (Evaluation)

M. XIE YANMOU, Ingénieur, Chef de Division

Mme ZHANG ZHENLING, Ingénieur Adjointe au Chef de Division

Mr WU DIANYUN, Ingénieur

Mr TONG ZHENQUIU, Technicien

## Annexe VIII Compte rendu journalier de la mission

MISSION EN CHINE DE MONSIEUR BOUHAGEB  
CONSULTANT POUR LE COMPTE DE L'ONU (DP/CPR/80/017 AGRICULTURAL  
MACHINERY TESTING CENTRE) DU 2 AU 30 SEPTEMBRE 1983.

Vendredi 2 Septembre. Arrivée à Pékin et accueil par Mme Wang et M. Xi de la Station de Pékin.

Samedi 3. Visite à l'ONU et accueil par M. Sissing. Préparation de la mission.

Lundi 5. Prise de contact avec les responsables de la Station de Pékin. Visite de la Station. Liste et état d'avancement des travaux. Accueil de M. Maibaum (Sté Stenck).

Mardi 6. Etablissement d'un programme de travail. Réunion sur les problèmes de refroidissement de l'eau des freins. Cablage des DMR 40 sur W700 et W400.

Mercredi 7. Modification du système de refroidissement de l'eau. Préparation du tracteur Shanghai 50 sur W700. Etablissement du courant électrique dans la salle de mesure.

Jeudi 8. Etalonnage du frein W700 et du frein W400. Fin de la mise en place du tracteur Shanghai 50. Discussion préliminaire sur les essais aux champs avec la division Test de Vulgarisation. Choix du tracteur Deutz et d'un cultivateur Chinois.

Vendredi 9. Démarrage de l'essai du tracteur Shanghai 50 et courbes préliminaires. Réglage des pentes de régulation sur W700. Mise en place et démarrage de l'essai du moteur Pékin 4115 sur W400. Décision de remplacer ce moteur par le tracteur Tiéniu 65 destiné aux essais aux champs. Accueil de M. Méchineau à l'aéroport.

Lundi 12. Essais officiels du tracteur Shanghai 50. Report de l'essai au Mercredi par suite de la température d'ambiance trop élevée (29°C) et d'un mauvais rapport de transmission. Préparation de séminaire.

Mardi 13. Séminaire sur les essais de performance du tracteur selon le Code OCDE et réponses aux questions.

Mercredi 14. Essais officiels du tracteur Shanghai 50 et sortie des courbes caractéristiques sur calculateur HP 9845. Réunion sur les essais aux champs.

Jeudi 15. Discussion avec le constructeur du tracteur Shanghai 50 sur les procédures d'essai. Réglage de l'alignement du moteur 495 A Shanghai sur W70. Démarrage de l'essai et décision de tester uniquement le frein, le moteur étant trop puissant par rapport aux courbes caractéristiques du frein W70. Mise en place du tracteur Tiéniu 65 sur W400.

Vendredi 16. Séminaire sur les essais de cabines de sécurité selon le Code de l'OCDE et réponses aux questions.

Lundi 19. Séminaire sur les freins Schenck, partie mécanique, la partie électronique et la maintenance étant traitée par M.Maibaum de la Sté Schenck. Préparation de l'essai Tiéniu 80 sur W700.

Mardi 20. Essai du tracteur Tiéniu 80 et sortie des courbes sur le calculateur HP 9845.

Mercredi 21. Vérification sur W70 des jeux du rotor. Préparation de séminaire.Reunion sur le frein W70.

Jeudi 22. Séminaire sur l'essai du relevage et de la pompe hydraulique selon le Code de l'OCDE. Séminaire sur les essais de motoculteurs Réponses aux questions.

Vendredi 23. Essais des matériels: freinomètre, sonomètre, et analyseur de gaz. Réunion sur les freins Schenck, conclusions du séjour de M.Maibaum de la Sté Schenck. Accueil de M.Billot a l'aéroport.

Samedi 24. Visite de l'usine de moteurs: Beijing General Internal Combustion Engine Plant, accueil par M.Fu Changquau, Directeur. Visite de l'Academie de Machinisme Agricole de Pékin.

Lundi 26. Essais du tracteur Fiat 1300 DT et du moteur Shangai 50 pour vérification des conditions de refroidissement des freins.

Mardi 27. Essais du tracteur Tiéniu 65, nouveau modèle et courbes d'isoconsommation. Mise en route de la balance de consommation S3EP. Visite au représentant de la Sté B et K pour la réparation du sonomètre.

Mercredi 28. Discussion avec M.Ni, Chef de la Section Information et Documentation pour des échanges d'information avec le CEMAGREF. Essais de composants du banc de relevage et banc des motoculteurs. Réunion sur les conclusions du séjour.

Jeudi 29. Rédaction du compte rendu. Discussion et examen des plans des bancs en cours de construction: banc dynamique, banc de relevage et banc d'inertie.Essais aux champs du tracteur Tiéniu 65 et du cultivateur Chinois avec la telemesure.

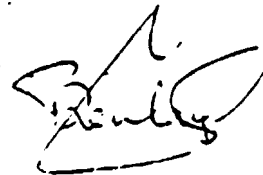
Vendredi 30 Septembre. Conclusions et derniers contacts du séjour. Départ pour Paris.

Pour la Station d'Essais de  
Machines Agricoles de Pekin.

唐秉恆

M. Tu Bingheng

Pour le CEMAGREF.



M. Bouhageb

le 30 Septembre 1983.

Annexe IX Liste de documents remis à M. TU Bingheng Directeur Adjoint Ingénieur en Chef, lors du séjour de M. Bouhageb du 2 au 39 Septembre 1983 à la Station de Pékin.

1 exemplaire des Codes d'essais OCDE version française et anglaise, pour les essais de performances des tracteurs agricoles et essais dynamiques de structures de sécurité : C(80)60 FINAL.

1 exemplaire de l'Amendement aux Codes de l'OCDE portant sur l'application d'un Appendice III : Code normalisé de l'OCDE pour les essais officiels de structures de protection montées sur les tracteurs agricoles : essais statiques AGR (83) 11 (2ème Révision) version anglaise et française.

1 exemplaire de l'Amendement aux codes de l'OCDE pour les essais dynamiques de structures de sécurité AGR (83) 12 version française et anglaise.

1 exemplaire de la Norme française U 10-205 Mai 1983. (ISO 789/6) Méthodes d'essai : Partie 6. Centre de gravité (en français).

1 exemplaire de la Norme française U.10-202 Mai 1983 (ISO/789/3) Méthodes d'essai : Partie 3. Diamètres de braquage et de dégagement (en français).

1 exemplaire de la Norme française S 31-041 Octobre 1975. Mesure de bruit à la place de travail de l'opérateur sur les tracteurs et les machines agricoles (en français).

1 exemplaire de la Norme française U 02-103 Novembre 1975. Forces pour manoeuvrer les commandes (en français).

1 exemplaire de la Norme Internationale ISO 500-1979 (F) Spécifications. Prise de force et barre d'attelage.

1 exemplaire de la Norme française U 02-047 Octobre 1979. Méthodes d'essai dynamique et statique pour tracteurs vigneron et tracteurs étroits, bâtis de protection à 2 montants en position avancée (en français).

1 exemplaire de la Norme française U 02-061 Mai 1983 (ISO 3462) Point de référence du siège. Méthode de détermination (en français).

1 exemplaire de la Norme française U 02-046 Juillet 1979. Méthode d'essai dynamique des tracteurs vigneron et tracteurs étroits, cadres et cabines de sécurité (en français).

1 exemplaire de la Norme française U 10-152 Avril 1972. Code d'essai au banc des moteurs (essai au banc) Puissance nette des tracteurs et machines agricoles (en français).

1 exemplaire de la Norme française U 10-154 Décembre 1974.  
Détermination et expression de la Consommation de carburant des  
tracteurs agricoles (en français).

1 exemplaire de la Norme française U 10-200 Mai 1983 (ISO  
789/1). Méthodes d'essai. Partie 1. Essais de puissance (en français)

1 exemplaire des procès verbaux des freins Schenck lors de leurs  
essais à Darmstadt (copie) (en français).

1 exemplaire d'un mémoire d'étude de M. Beets sur le réglage  
et mise au point d'un banc de motoculteur (en français).

1 exemplaire de la liste des consommations des tracteurs selon  
la norme NF U 10-154 (en français). Brochure publiée par l'association  
française pour la Maîtrise de l'Energie sur la base des résultats  
d'essais effectués à Antony ou présentés dans les bulletins d'essais  
de tracteurs et soumis par d'autres Centres d'Essais Nationaux  
par l'approbation du Centre de Coordination pour la mise en application  
des codes normalisés de l'OCDE pour les essais officiels de tracteurs  
agricoles).

